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Notes on the History Of Military Medicine

*(Expanded from two lectures delivered at The Medical Field Service School, Carlisle Barracks, Pa.,
June 21-22, 1921)*

BY

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PREFACE

In their present form these chapters, originally printed in *THE MILITARY SURGEON* during November, 1921—August, 1922, are an expansion of two lectures delivered at the Medical Field Service School, Carlisle Barracks, Penna., on June 21–22, 1921. Designed as they are for the information and instruction of student medical officers at the Army Medical School, they cannot profess to give more than a definitive outline of the history of a great subject. But with the aid of the footnote references, derived from the matchless resources of the Surgeon General's Library, it is conceivable that the senior officer may be in position to expand the theme indefinitely for purposes of lecturing, writing or otherwise.

During the World War the United States Army, particularly its Medical Corps, had an opportunity to achieve great results on a grand scale such as had never been offered it before in all its history. One effect of this great expansion, this unique opportunity to think in large terms, was to dispense, for the time being at least, with certain obsolete or obsolescent conventions of the service which had tended to narrow the viewpoint of the individual and, in extreme cases, demonstrably to engender bitter hatred against the Army in certain quarters.

In other words, military discipline is now an affair of handling the individual with such impersonal equity and fairness as to make him a true disciple (*discipulus*) of the centric ideal, viz., the preservation of our Army for the maintenance of peace and for the defense of our common country in time of war. During the recent war the science of military morale was so effectively developed by one of our medical officers that it became possible to manufacture reliable conduct in men "like cotton cloth." The merest glance at these pages will convince any candid reader that the part played by medical personnel in the maintenance of military morale is of extraordinary moment. It was to forward this *motif* that this book was written, in the hope and belief that a glimpse of the "ampler aether" which is the history of his profession will convince the young medical officer that, in successful military operations of modern type, patriotism is the motor power, and military administration the mechanism by means of which great things are to be accomplished and victories won.

In completing these pages the writer desires to express his sincere gratitude to Col. James Robb Church, editor of *THE MILITARY SURGEON*, for advice and encouragement, and to Major Arthur N. Tasker, M.C., and Mr. S. E. Womeldorph for timely assistance in the revision of copy and the correction of proofs.

F. H. G.

WASHINGTON, D. C.,
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CHAPTER I

Introductory

SINCE the time of Frölich¹ it is commonly agreed to include under the term "military medicine" all that relates to military hygiene and sanitation, military surgery, medico-military administration, medico-military transport, recruiting, sanitary formations and training.

The history of military medicine has two main aspects, the professional or scientific and the administrative. Progress in military medicine, as a branch of medical science, has turned upon two principal coefficients—the advancement of scientific surgery and the advancement of the science of infectious diseases. Bacteriology has done more for this phase of the subject than anything else. The development of medico-military administration as a mechanism to assist in winning victories and to further the ends of medical science has turned upon a single factor, viz., the need of any nation for an organized standing army, however small as a mechanism for its defense in time of need. In past history, the fate of all armies hastily levied, without forethought and preparedness, has been monotonously the same—faulty sanitation, tremendous mortality from communicable diseases, disastrous mortality from battle wounds. Except in well-organized armies, like the Roman or those of Frederick and Napoleon, never a sign of a sanitary formation, significant silence in the records as to organized care of the sick and wounded. In modern times the need for some sort of military organization as a nucleus for the defense of a nation in time of war has been recognized by every modern state. Armies exist so long as war remains a biological phenomenon beyond the control of man, and even should the possibility of war be reduced to a minimum (on paper), small armies and navies will still be necessary to maintain the peace of the world.

Wars are only a phase of the general phenomenon that life itself, in all its aspects, is conditioned by a conflict of elements, the nature of which we but dimly comprehend, beyond the well-known law of physics that forces always flow from higher to lower potentials. Wherever life

¹ H. Frölich: *Militärarzt*, Wien, 1874, xxiv, 45; 57, and the introduction to his *Militärmedizin*, Braunschweig, 1887, 1-4.

manifests itself upon earth, there is a constant warring of diverse elements, without which there is apt to be decadence and stagnation. The painful evolution of man himself from his low prehistoric estate as an animal to his present civilized status was accomplished in just this wise. Not a single advance in our boasted civilization was made without conflict over contested ground. Physical chemistry teaches that life turns upon the surface energies of protoplasm. One of the greatest of modern physicists asserts that the struggle for existence of living matter is a war for free energy, and that when the free energy of a living organism (say a defenseless nation) becomes a minimum, its death is at hand.

In prehistoric or primitive society man is a wild animal with many degrees of freedom, compelled to do his own thinking and quick to defend himself. In civilization he becomes a tamed or domesticated animal, like a fireside cat or a potted plant, with little freedom, hardly any mechanisms of defense, his thinking usually done for him by others. Human history in the past has been largely made up of raids and wars of lawless, nomadic, barbaric elements upon settled, civilized, domesticated elements, and where the latter has been overcome it is because they have lost the power and means of defending themselves. Thus the pacifists and idealists of defenseless nations are, in a sense, *particeps criminis*, passive and pacific agents of their own dishonor, of the possible enslavement and degradation of their women and children or of other people's women and children. The French proverb runs: *Qui se fait brebis, le loup le mange*.

Beyond this statement of scientific fact, no explanation seems necessary for the existence of armies as such. The smallest nations, definitely organized as racial or social units, have never been without them in historic time, and for excellent reasons: if defenseless, they were sure to be invaded, subjugated, absorbed or partitioned through the intrigues of diplomacy and the "crimes of kings." The military status of Switzerland was adequate to maintain the autonomy of this small but sturdy state during the entire European War, while the valiant stand taken by Belgium recalls the ancient tribute of Julius Caesar: *fortissimi omnium horum Belgae*. But the European war has brought in its train a vast diminution of the productive power of civilized humanity, a demoralization and degradation of human dignity, which has embittered thousands of minds and hearts and, as usual in history, this bitterness is vented not upon those who intrigued to make the war possible but upon the general theory of military establishments. It is characteristic of human nature and of the feebleness of the human mind that, in real life, the

true villains in the play should always manage to rehabilitate themselves in the last act and so get the better of the poor *mens sibi conscia recti*.

The present feeling of the discharged civilian volunteer is expressed in the sentence of a living English novelist: "Everybody liked the war except those who had to fight it."³ The gigantic profiteering, the widespread decadence of morals, the enormous waste, as well as destruction of human life and material resources, the impoverishment of hundreds who cheerfully gave up their all to find their occupations gone upon discharge from service, have produced in the civilian population a fierce and very natural reaction against warfare in general and expensive armaments in particular.

While no individual battle of the World War was as destructive relatively as Thermopylae, or Cannae, or Gettysburg, or Custer's fight at Big Horn, the havoc wrought by high-power explosives and the employment of such offensive measures as gas attacks, air or submarine raids, which gave the victims no fighting chance, no power of motor resistance—all this has created a powerful world sentiment against the future possibility of wholesale slaughter of the defenseless, although the triviality of recent city life seems to "mock the riddled corpses round Bapaume." Military men, as well as statesmen, are therefore committed to the hope and belief that world sentiment and the future solidarity of mankind may perhaps avail to diminish (if not entirely prevent) the megalomania of warfare for conquest by great powers; but, judging the future by the past, it is highly probable that small armies will always be necessary to execute the will of governments in maintaining world peace and as expansile nuclei for defense against invasion in time of need. Thus the organization, strength and efficiency of the German Army were admired everywhere, as long as that army was regarded as a bulwark of intranational stability, but the entire non-Germanic world turned against it when the great war itself was perceived to be a definite break-up of world-equilibrium, a special case of "inter-molecular wobble," which is said to have ruined the business even of caravans in the Far East.

The soldier, in relation to world warfare and the possibility of the invasion and conquest of his country, is thus, in a sense, an analogue of the doctor, in relation to major epidemics and the protection of his clientèle from communicable or fatal diseases. In time of peace the military man labors at humdrum duties, on relatively small pay, to assist his government in maintaining a stable social order; in time of war he is his government's principal agent and mainstay in elaborating

³ W. L. George: "Blind Alley."

proper mechanisms of defense against the enemy. In time of peace the medical officer is the family physician and sanitarian of his particular organization; in time of war he must devise ways and means to forestall and prevent epidemic diseases and to deal with the "traumatic epidemic" which Pirogoff declared war to be. The analogy drawn by Crookshank⁴ between the World War and the far most destructive epidemic of Spanish influenza (1918-19) seems true in all its parts. Both were biological phenomena, of remote, multiplex or undecipherable causation, arising suddenly, and nowise preventable by merely deciding or wishing that such things should not be; both were ultimately suppressed and ended by boldly going forth to meet them, *venienti occurrere morbo*, on the principle of Newton's third law of motion. Assuming, then, that world peace, a stable intranational equilibrium, is the "far off divine event to which the whole creation moves," the soldier and the doctor are really working toward the same end, the soldier to diminish the possibility of wars of magnitude by the maintenance of world peace, the physician to prevent the occurrence, recurrence and spread of communicable diseases by sanitation. On that great day, when wars and disease shall have become non-existent, both may, like Wotan, cheerfully will their own annihilation. To that millennium, Billings applied the ironical "Kannuri" proverb: "The day being finished, there is an end of medicine."

II. Bibliographical Sources

The existing literature of military medicine is of unusual extent, and at sundry intervals of time, medical officers of different nations have striven to take an account of stock by arranging this complex material in some orderly and logical sequence. This is the function of medical bibliography, by which is meant, not the minute description of books, like objects in natural history, for identification by the bibliophile, but the arrangement of book titles and indexed articles in such wise that the physician may gain from it a complete purview of the existing state of knowledge of the given subject at the time the bibliography was prepared. A thoroughgoing analytical bibliography of a medical subject is the key to its literary history up to the time of preparation or publication. Much may be done by this method, as a scaffolding for investigation or writing. Thus the bibliography of pediatrics by F. L. Meissner (1850) contains all the literature from 1472 to 1850, arranged by subject headings, and affords a complete picture of the historical development of the specialty to that date. The same thing applies to Lehr's remarkable calendar of psychiatry (1901), which gives the literature

⁴ F. G. Crookshank: *MILITARY SURGEON*, Wash., 1921, xlviii, 172-179.

and events from 1459 to 1799, arranged in chronological order. In the Index Catalogue of the Surgeon General's Library the historical literature of military medicine is arranged, by wars and campaigns, in alphabetical order. Now the basic literature of the history of military medicine is peculiar in that, prior to the end of the eighteenth century, its meager data are commonly buried in secular (non-medical) writings and the memoirs of great personages, for in this earlier period medical officers, as such, were non-existent, and military surgeons, when attached to armies, were virtually vassals and body physicians of kings and powerful nobles. After the eighteenth century, when the proper care of the sick and wounded soldier became a function of government, the basic (authentic) data are usually to be found in the military orders, circulars, statistical reports and other public or confidential documents of the military establishments of various nations. The approaches to the subject are therefore difficult, widely separated, and sometimes inaccessible. It is for this reason, as Straub once observed, that the history of military medicine, like the history of public hygiene, has remained largely unwritten.⁵ Excellent surveys are afforded in the histories of military surgery by Köhler (1901) and Cabanés (1918), but the subject has been otherwise investigated only in particular campaigns, histories of medical departments of armies and suchlike phases, and no consecutive and continuous history, based upon archivist research, has been prepared to date. In the present brief narrative the writer can indulge no pretensions to the vast erudition and military experience required for the larger task, but on the assumption that a sketchy outline may at least stimulate others to further research, it is hoped that the bibliographical and similar data may be useful.

The earliest list of bibliographical titles on military medicine is that of Carl Philipp Diez, consisting of valuable footnotes to his graduating dissertation on the condition of the atmosphere and of food as matters of moment in military hygiene (1762).⁶

In the following year Ernst Gottfried Baldinger (1738–1804), a Prussian army surgeon and medical historian, published, as an appendix to his dissertation on diseases of armies (1763), an extensive bibliography, which was separately printed as an enlarged second edition in 1764.⁷ This important pamphlet, the starting point of all subsequent

⁵ Outside the military profession, the subject has otherwise excited no interest, for the reasons above given. One of the greatest of modern medical historians, when approached on the matter replied: "The subject is distasteful to me."

⁶ C. P. Diez: *De aere et alimentis militum praecipuis hygienis militaris momentis*, 4°. Tübingen, 1762.

⁷ E. G. Baldinger: *Introductio in notitiam scriptorum medicinae militaris*. 8°. Berlin, 1764. For a detailed account of this work see H. Frölich: *Deutsche Vrtljschr. f. öffentl. Gsndhtspfleg.*, Braunschweig 1875, vii, 362–366.

bibliographies of military medicine, is arranged in seven sections, comprising 133 titles, most of which are provided with brief critical or explanatory notes by the compiler. As more than half of this work (the surgical part) had been irrecoverably lost by the Berlin printers, Baldinger frequently announced that he was working on a third edition, of which he published some fragments in 1791.⁸ But this project he never lived to complete. After his death in 1804, his fine library of 15,559 volumes was purchased by the Grand Duke of Hesse, to be absorbed by the Court Library at Darmstadt.⁹

Following the Baldinger publication, a number of other useful bibliographies appeared at intervals, viz.:

- 1845. IRVING (JAMES): *A Concise View of the Progress of Military Medical Literature in this Country*. James Irving (1822-98) was an Edinburgh medical graduate who entered the Indian Medical Service in 1847 and was the first surgeon general of the combined provinces of Bengal and Oressa (1878). His contribution of 82 pages gives concise analyses of all the important English books, from Gale's treatise on gunshot wounds (1563) to 1844, a period of nearly 300 years. His object, he admits, is to impress the young physician with the advantages of service in the British Army for "the study of practical medicine."
- 1862. ROSIER (VICTOR): *Essai d'un bibliographie universelle de la médecine et de la chirurgie militaire*. Contains 4,424 titles, mostly French, and includes everything listed by Baldinger.
- 1873. FRÖLICH (HERMANN): *Zur Bücherkunde der militär-medicinischen Wissenschaft*. Contains an interesting list of titles, arranged in chronological order, from 1497 to 1872. While many important items are lacking, this list is a good conspectus of the progress of military medicine in time, as judged by the texts. The rest of Frölich's work, which is of a more important order, is given below.
- 1876. FRÄNKEL (G. H. F.): *Bibliotheca medicinae militaris et navalis. Beiträge zur Literatur der Militär-und Schiffsheilkunde, Part I* (Glogau, 1876). Consists of titles of graduating dissertations and academic programs, arranged in alphabetical order, with a subject index at the end. No more published.
- 1880-1921. *Index Catalogue of the Library of the Surgeon General's Office*, 1-3 series, 40 volumes. Edited by the late Col. John S. Billings and the successive librarians of the S. G. O. Contains subject bibliographies of all branches of military medicine. As these contain, for the first time, the articles indexed in medical periodicals, they are of more practical use than the earlier lists, made up of books and pamphlets alone. The more important rubrics are Armies; Army; Hygiene (Military); Medicine (Military); Surgery (Military), with subdivisions, e.g., Medicine (Military, History of) by Campaigns, Sieges and Wars. These can easily be found, in proper alphabetical sequence, in each of the three series, which cover literature as follows: 1st Series (16 volumes, A to Z) from earliest periods to 1895; 2d series (21 volumes), 1896-1916; 3d series (3 volumes so far published), 1918 to date.

⁸ Baldinger: *Neues Mag. f. Aerzte*. Leipzig, 1791, xiii, 458-462.

⁹ Frölich: *Militärmedizin*, 1887, 6.

1914. TICHY (FRANZ): *Militärärztliche Literatur in den Jahren 1700 bis 1850. Beitrag zur Geschichte der Medizin* (Militärarzt, Wien, 1908, XLII, 329. *Deutsche mil.-ärztl. Ztschr.*, Berl., 1914, xliii, 609-618). An analysis of the medico-military literature of 150 years (1700-1850).

Perusal of any of the above are highly instructive, as indicating the kind of tasks and problems which occupied the minds of medical officers in the different historical periods. The reader may note, by simple inspection of the titles, the enormous literature of gunshot wounds and hospital gangrene, and the changes in point of view as to treatment; the speculations as to the nature of Hungarian camp (typhus) fever (*De lue pannonica*) during the sixteenth to eighteenth centuries; the extensive literature on Egyptian ophthalmia (trachoma) after the publication of Larrey's monograph (1802); on conservative amputation after Bilguer's essay (1761); on heat stroke, following the investigations of the Indian Medical Service; on malingering (*De morbis fictis*) and its detection from the earliest times; on moral support of the patient during amputation prior to the introduction of anesthesia; on the status of *débridement* from Larrey to Lemaître; on the social distress and bad hygienic status of the population following the Napoleonic Wars (*De damno et calamitate quae in sanitatem publicam et societatem ex perpetuo bello redundat*). Even a list of books shows that there is nothing new under the sun.

Much more important for historical investigation is the work of a number of scholars who first grappled with special segments of this difficult material and endeavored to get the inwardness of it and to draw conclusions from it. Upon the findings of these investigators, much of recent writing has been based. Early in the nineteenth century (1807-9) nine dissertations were published by various medical students at the University of Wittenberg on the set theme: "In what manner did the Romans render aid to wounded soldiers in battle?"¹⁰ This was a new departure, something quite different from merely listing the books and analyzing them *seriatim*, as Baldinger had done for the literature up to 1764, or Irving for the English literature between 1563 and 1844. As Latin students' dissertations go, this method was absolutely sterile and unproductive when applied to the live subject of military medicine itself, for the many Latin contributions of the seventeenth and eighteenth centuries were written, not from actual fresh experience in the field, but merely as summaries of the works of predecessors, with a musty flavor of the lamp, the inkhorn and the stuffy little room with porcelain stove.¹¹ But in establishing data for the *history* of our subject it was

¹⁰ Disceptata quaestio: Quibus modis militibus in pugna vulneratis succurrerint Romani? *Commentationes* i-ix. 4°. Wittenberg, 1807-9. These are rare and not in the Surgeon General's Library.

¹¹ For a sound view of this "*Stubenwissenschaft*" see A. Dreyer: *Med. Ztg. Russlands*, St. Petersburg, 1855, xii, 196-198.

necessary that some such steps be taken. The most remarkable work in this line was done by Kühn and Frölich.

Kühn's Prolegomena

The French surgeon, Verneuil, once observed that "while erudition certainly creates nothing, it leads to creation. To discountenance research in literature (he goes on to say) is like advising travelers who visit regions not fully explored to refrain from making use of the maps prepared by their predecessors. The great objection to such work is the amount of time which it requires, if it is to be done thoroughly and accurately." The life work of Carl Gottlob Kühn (1754–1840) is exemplified in these lines. Professor of medicine at Leipzig for more than half a century (1785–1840), he was one of the greatest of medical scholars, an editor and commentator of all the older writings, from Hippocrates and Galen to Sydenham, Huxham and Baglivi. To him we owe the great bilingual of Galen in 20 volumes, which is still used in libraries along with Littré's bilingual of Hippocrates. During 1824–27, Kühn published eight academic programs (faultily numbered, he admits, as I–VI, X, XI) on the status of military medicine among the Greeks and the Romans.¹² These deal with (I) military medicine in the Trojan War (Homer), (II–III) in Xenophon, Polybius and Hyginus, (IV–V) in the Roman inscriptions of the Empire, (VI–VIII) in the legal codes of Augustus and the later emperors. Written in Latin, these studies are not readily accessible today, but Kühn's findings have fortunately been absorbed in the general body of knowledge. This is evidenced by the amount of literature on Greek and Roman military medicine which has followed his original presentation of the theme, e.g., Zimmermann (1834), Sir James Y. Simpson (1856), Briau (1866), Gaupp (1869). More extensive independent and original investigation has since been made, notably in the solid monographs of Daremberg (1865), and Frölich (1879) on medicine in Homer; but much in the way of borrowed plumage and pasted jewels of citation is elsewhere easily traceable to the elder writer.

Frölich's Prolegomena

A man of far different type was Franz Hermann Frölich (1839–1900), one of the surgeons general of the Saxon army (1893–1900). Frölich entered the military service before his graduation in medicine, served in three wars, and was a leading authority on his subject in his day. Beginning with his graduation dissertation (Leipzig, 1862),¹³ his writings,

¹² C. G. Kühn: *De medicinae militaris apud veteres Graecos Romanosque conditione*. Program-mata I–VIII, 4°, Leipzig, 1824–7.

¹³ This, a study of temperature relations in typhoid fever in troops, was prepared under the direction of Wunderlich, and published three years before the appearance of the latter's treatise on clinical thermometry (1869).

219 in number, are exclusively about military medicine, and his great treatise of 1887 was the first book in which the theme is treated by and large, in all its branches. His recommendations as to chest measurements in troops (1869) were officially adopted for the German army and navy ten years later (1879). He was a warm personal friend of Colonel Billings, librarian of the Surgeon General's Office, with whom his correspondence was extensive.

Frölich, a man of fine classical education, was the most prolific of all writers on the history of military medicine. His many contributions were undoubtedly so many preliminary studies to a complete book on the subject. The best of this material was, however, absorbed in his general treatise on "Militärmedizin" (1887), which begins with an extraordinary layout of the basic historical sources. The bibliographical sources for the military medicine of antiquity are accurately indicated, as to chapter and verse, from Homer and the Bible, through Livy, Caesar and the other Roman writers, up to the Dark Ages. The bibliography of the modern period is, however, poorly arranged and more difficult to follow. Frölich was, in fact, a careless bibliographer, but no one ever used this tool to better advantage. During his period of activity (1869–1901) he produced scores of books and articles dealing with every historical aspect of his subject, not all of equal merit, it is true, but unquestionably the best of their kind, and a source of inspiration to all future students. The literary style is somewhat diffuse but colorful, and the frequent handling of identical themes suggests that Frölich was working to perfect himself for a definitive summary of the whole subject. His amazing productivity is indicated in the following lists of titles:¹⁴

- 1869. J. A. à Gehema's book, "The well-equipped Field-Physician" (1684). Allg. mil.-ärztl. Ztg., Wien, 1869, 195: 204.
- 1872. Celsus on the operative treatment of wounds from projectiles. Deutsche mil.-ärztl. Ztschr., Berl., 1871, I, 525–535.
- 1873. On the bibliography of military medicine. 50 pp. 8°. Berlin, 1874. Supplement to: Deutsche mil.-ärztl. Ztschr., Berl., 1873-4, II–III.
- Contributions to the history of military medicine. Allg. mil.-ärztl. Ztg., Wien, 1873, XIV, 4; 20; 28; 37; 41.
- Hieronymus Braunschweig on gunshot wounds (end of the fifteenth century). Militärarzt, Wien, 1873, VII, 116–120.
- The outposts of medico-military literature, Militärarzt, Wien, 1873, VII, 17–20.
- 1874. On the content of military medicine. Militärarzt, Wien, 1874, XXIV, 45; 57.

¹⁴ This list has been prepared and verified from the somewhat faulty bibliography of his collective writings (1869–83), made by Frölich himself in Wien. med. Presse, 1884, xxiv, 999; 1061; 1089, and the completion of the same (1884–1901) in the obituary notice by Helbig in Reichs-Med.-Anzeiger, Leipz. 1900, xxv, 471–472.

1874. On a discovery relating to the military surgery of the Middle Ages. *Deutsche mil.-ärztl. Ztschr.*, Berl., 1874, III, 583-594.
 On the history of military medicine in England. *Militärarzt*, Wien, 1874, XXIV, 169; 179; 185; 195; 1875, XXV, 3; 11; 19; 51.
 History of the Regulations of the Medical Department of the German Army *Vrtljschr. f. gerichtl. u. öffentl. Med.*, Berl., 1874, XXI, 100-128.
1875. On the earliest bibliography of military medicine. *Deutsche Vrtljschr. f. öffentl. Gsndhtspflg.*, Brnschw., 1875, VII, 362-366.
 Guide to the investigation of the history of military medicine in antiquity. *Militärarzt*, Wien, 1875, XXV, 177; 178.
1876. The helmets of Homer's heroes. *Arch. f. path. Anat.*, Berl., 1876, LXVIII, 381-398.
 The oldest known case of malingering. *Feldarzt*, Wien, 1876, XXI, 61; 65.
 Thoughts on the prehistoric origin and later developments of aid to the sick and wounded in war. *Feldarzt*, Wien, 1876, XXI, 81; 101.
1877. Barracks in the Trojan War. *Arch. f. path. Anat.*, Berl., 1876, LXXI, 509-514.
 Catalogue of the Library of the Medical Department of the Saxon Army. 138 pp. 8°. Dresden, 1877.
 Medical features of the Turco-Serbian campaign of 1876. *Deutsche mil.-ärztl. Ztschr.*, Berlin, 1877, VI, 110; 168; 205.
 The Saxon Army Medical School. *Feldarzt*, Wien, 1877, 49; 53.
- 1877-8. Periodical literature of 1870-76 on the medical history of the Franco-Prussian War. *Feldarzt*, Wien, 1877, 61; 65; 69; 78; 98; 1878, 2; 14.
- 1877-82. Status of military medicine during the years 1877-82. *Jahrb. f. prakt. Med.*, Berlin, 1877-82, *passim*.
1878. Ancient Oriental military medicine, *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1878, I, 27-42.
 The chiton of Homer's heroes from a sanitary viewpoint. *Arch. f. path. Anat.* Berl., 1878, LXXIII, 625-628.
 Contribution to the medical history of the Franco-Prussian War. *Militärarzt*, Wien, 1878, XII, 185; 193; 204; 211; 217.
 Report on military medicine at the Paris Exposition of 1878. *Deutsche med. Wochenschr.*, Berl. 1878, IV, 495; 507; 522.
1879. Bibliography of recruiting. *Schmidt's Jahrb.*, Leipz., 1879, CLXXXI, 201-206.
 History of the Medical Regulations of the Saxon Army. *Wissensch. Ber. d. k. sächs Sanitätsdienst*, Dresd., 1879, 25-62.
 The military medicine of ancient Greece in the post-Homeric period. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1879, II, 395-404.
 Military medicine in Homer. 65 pp. 8°. Stuttgart, 1879.
 On the military surgery of the 17th Century. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1879, II, 142-144.
1880. The antiquity of gunshot wounds. *Wien. med. Presse*, 1880, XXI, 218-220.
 Historical data on the military medicine of the Germans in antiquity and the Middle Ages. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1880, III, 222-256.
 Paul of Ægina as a military surgeon. *Wien. med. Wochenschr.*, 1880, XXX, 1241; 1265.
 On the basic periodical literature of military medicine. *Schmidt's Jahrb.*, Leipz., 1880, CLXXXVI, 84-87.

- On the war surgery of the ancient Romans. Arch. f. klin. Chir., Berl., 1880, XXV, 285-321.
1881. Historical aspects of recruiting from the viewpoint of military medicine. Mil. Wochenbl., Berl., 1881, No. 79.
1882. On the beginnings of military medicine in The Middle Ages. Deutsches Arch. f. Gesch. d. Med., Leipz., 1882, V, 75-80.
- Some of the oldest essays on gunshot wounds. Arch. f. klin. Chir., Berl., 1881-2, XXVII, 593-613.
- Notes on sanitation in the Egyptian campaign. Wien. med. Presse, 1882, XXIII, 1621; 1651.
- War-surgery a thousand years ago. Arch. f. klin. Chir., Berl., 1882-3, XXVIII, 862-866.
1883. The literary sources for the military medicine of antiquity and the Middle Ages. Wien. med. Presse, 1883, XXIV, 938; 1069.
1884. Albucasis on war-surgery. Arch. f. klin. Chir., Berl., 1884, XXX, 364-376.
- Contribution to the literature of instruction in military medicine. Militärarzt, Wien, 1884, XVIII, 107; 115.
- On the oldest Austrian periodical of military medicine, Militärarzt, Wien, 1884, XVIII, 102.
- On the ophthalmologist, G. J. Beer. Wien. med. Wochenschr., Berl., 1884, XXXIV, 1503-1505.
- The periodical literature of military medicine. Militärarzt, Wien, 1884, XVIII, 67-70.
- War surgery in Avicenna. Arch. f. klin. Chir., Berl., 1884, XXX, 745-752.
1885. The beginnings of military hygiene in the Middle Ages. Deutsche Vrtljschr. f. öffentl. Gsndhtspf., Brnschw., 1885, XVII, 433-436, *Also*: Militärarzt, Wien, 1887, XXI, 9-12.
- Cultural history of the aims of instruction in military medicine. Neue mil. Bl., 1885, Hft. 1.
- Origin of military medicine. Militärarzt, Wien, 1885, XIX, 81; 89.
1886. War-wounds in the Middle Ages and their treatment. Oesterr. mil. Ztschr., Wien, 1886, 50.
1887. The beginnings of military hygiene in antiquity and the Middle Ages. Militärarzt, Wien, 1887, XXI, 9-12.
- Bibliography and literary sources of the history of military medicine. *In his*: Militärmedizin, Braunschweig, 1887, 5-35.
1888. History of the Medical Corps of the Saxon Army. 148 pp. 8°. Leipzig, 1888.
- Losses in war. Oesterr. mil. Ztschr., Wien, 1888, 90-109.
- The oldest medical regulations of the German Army. München med. Wochenschr., München, 1888, XXXV, 910.
1889. Officers' field-chests. Militärarzt, Wien, 1889, XXIII, 113-117.
- Galen on malingering. Friedreich's Bl. f. gerichtl. Med., Nürnberg., 1889, XL, 21-26.
1890. The earliest cases of gunshot wounds. Prag. med. Wochenschr., 1890, XV, 197.
- Medico-military libraries. Militärarzt, Wien, 1890, XXIV, 9; 17; 28; 35.
- Organization of the Medical Department of the U. S. Army. Militärarzt, Wien, 1890, XXIV, 105; 113.
1891. The health of Napoleon I during the Russian campaign of 1812. Militärarzt, Wien, 1891, XXV, 65-68.

- Recruiting in the United States Army. *Militärarzt*, Wien, 1891, Nos. 18-19.
 The military medicine of ancient Carthage. *Militärarzt*, Wien, 1892, XXVI, 17-20.
1893. Examinations for admission to the Medical Corps, U. S. Army. *Militärarzt*, Wien, 1893, XXVII, 49-52.
1895. The development of recruiting service; past and future, *Wien. klin. Wochenschr.*, 1895, VIII, 757-760.
 Did the armies of ancient Egypt have an organized medical service? *Wien. klin. Wochenschr.*, 1895, VIII, 924.
 The medical personnel of the British Army. *Samariter*, München, 1895, I, No. 23-24.
 Recruiting of armies in old times, *Leipz. Tagebl.*, Sept. 5.
 Voluntary nursing in the wars of antiquity. *Ztschr. f. Krankenpflg.*, Berl., 1895, XVII, 55-58. Also *Wien. klin. Wochenschr.*, 1895, VIII, 9.
1896. Comparison of the military hygiene of the Homeric period with that of today. *Vrtljschr. f. öffentl. Gsndtspflg.*, 1896, Hft. 1.
 Losses in war. *Ztschr. f. Krankenpflg.*, Berl., 1896, XVIII, 41; 66; 89; 116; 140; 163; 185; 211.
 Medical personnel of the Russian Army. *Samariter*, München, 1896, I, Nos. 8 et seq.
 Mortality and morbidity in the larger European armies in the time of peace. *Mil. Rundsch.*, 1896, Hft. 3.
 Nursing at the battle of Leipzig. *Leipz. Tagebl.*, 1897, March 9-18.
 Precursors in charitable nursing. *Reichs. Med. Anz.*, Leipz., 1898, XXIII, 161-164.
1897. Cremation in the Homeric poems. *Janus*, Amst., 1897-8, II, 248-251.
 When did the first gunshot wounds occur? *Heilkunde*, Wien, 1896-7, I, 502-505.
1898. Military hygiene in the American and Spanish Armies. *Centralbl. f. allg. Gsndhtspflg.*, Bonn, 1898, XVII, 242; 303.
 Schiller's early experience as an army surgeon. *Wien. med. Wochenschr.*, 1898, XLVIII, 1027; 1090; 1131.
1899. On a charitable aid from the animal kingdom. [History of the use of dogs in rescue of the wounded.] *Wien. med. Wochenschr.*, 1899, XLIX, 2251; 2291.
1900. Medical service of the British Army. *Centralbl. f. allg. Gsndhtspflg.*, Bonn, 1900, XIX, 19-33.
1901. Military medicine in the 16th century. *Janus*, Harlem, 1901, VI, 68; 123; 178; 253; 309; 366.

It is clear from the above layout that Frölich was assembling materials for a book up to the year of his death; but, given the insufficient knowledge of his time, he sometimes committed himself to glittering generalities, and his conclusion that Homer was himself a military physician did not win the acceptance of the German classical scholars.

Beginnings of Exact Documentation

Meanwhile, during the second half of the nineteenth century, individual books of a more exact and precisely documented kind had begun to

appear, e.g., the histories of the medical establishment of the Prussian Army by A. L. Richter (1860)¹⁵ and C. J. Prager (1864–5),¹⁶ and the massive history of the development and status of military medicine in European countries by Emil Knorr (1880),¹⁷ a major of the Prussian General Staff. These works, bristling with dates, statistics and footnote references to the literature and the official publications of governments, afford early instances of the kind of elaborate documentation now required in military history. To this *genre* Frölich himself contributed one admirable example, viz., his history of the medical department of the Saxon Army (1888), which is based upon state documents.

Myrdacz

In 1898 Paul Myrdacz, a staff surgeon in the Austro-Hungarian Army, published a huge volume containing separate histories of the existing medical establishments of Austro-Hungary, Germany, Italy, Russia, and France, with medical histories of the Crimean War (1854–6), the Italian Campaign of 1859, the Danish and Austro-Prussian Wars of 1864 and 1866, the Franco-Prussian War (1870–71) and the Russo-Turkish War (1877–8).¹⁸ This is a reference book of great value, particularly as to medical statistics of the principal European wars of the nineteenth century. It contains a chronological table of the principal events in the development of the medical department of the Austro-Hungarian Army, by S. Kirchenberger, which is again based upon government documents.

Köhler

In 1899 Albert Köhler, a Prussian staff surgeon, published, under the auspices of the Kriegsministerium, an elaborate series of biographies of German military surgeons and medical officers of the seventeenth and eighteenth centuries, which was further extended, to cover the whole of the nineteenth century, by Köhler, Bock, Hasenknopf and Kimmle (1901–4).¹⁹ These studies were the basic material for Köhler's short illustrated book, "Essentials of the History of Military Surgery" (1901),²⁰ which, as including an outline of the history of military medicine, is the handiest manual yet published. The treatment is concise and attractive, and, while exception may be taken to the excess of

¹⁵ A. L. Richter: *Geschichte des Medicinalwesens der Königl. Preussischen Armee*. 8°. Erlangen, 1880.

¹⁶ C. J. Prager: *Das preussische Militär. Medicinalwesen*, 8°. Berlin, 1864, 2. Aufl. 8°. Berlin, 1875.

¹⁷ E. Knorr: *Entwicklung und Gestaltung des Heeres-Sanitätswesens der europäischen Staaten*, 8°. Hannover, 1880.

¹⁸ P. Myrdacz: *Handbuch für k. und k. Militärärzte*, roy. 8°. Wien, 1898, II.

¹⁹ *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Berl., Heft 13, 1899: Heft 18, 1901: Heft 24, 27, 1904.

²⁰ Koehler: *Grundriss einer Geschichte der Kriegschirurgie* (Bibliothek von Coler, vol. 7) 80 Berlin, 1901.

Germanic data, the work is otherwise very reliable. The preponderance of German writings on our subject is easily explained by the essentially military character of the German and Austrian empires up to the European war. In 1855 Dreyer made a statistical study of 831 books on military medicine, and of these, 369 (48 per cent) were German, 187 English, 163 French and 54 Russian.²¹ In Germany even medical students and theologians have sometimes been moved to investigate the history of military medicine, and, as we have seen, the bulkiest and most elaborate contribution up to 1880 was made by an officer of the Prussian General Staff.

Cabanés

In 1918 Dr. Augustin Cabanés published a most interesting and valuable book, entitled *Chirurgiens et blessés à travers l'histoire* (Paris, 1918). As editor of the *Chronique médicale*, Cabanés had been hitherto the collector and amusing *raconteur* of the medical anecdotes and "indiscretions" of history, but in this large and well-illustrated book he appears as a very capable historian, carefully documenting his material everywhere and maintaining a just balance between French, English, German and other sources. The work is really an elaborate history of military medicine, attractive by its easy communicative style, its unique illustrations (225 in number) and the intelligent use which the genial author has made of the documentary material. Of special interest are the facsimile reproductions of French public documents of the Napoleonic period, e.g., the earliest printed commissions of medical officers, admissions to hospital, certificates of discharge, etc.

Miscellaneous Contributions from Continental Europe

On the continent of Europe, where nations and races of the most disparate type are contiguous and the possibility of war has been always imminent, the subject of military medicine and its history has been more closely studied than in detached, isolated countries like Great Britain or the United States. Apart from the larger works above mentioned, there is a considerable amount of pamphlet and periodical literature, the titles of which will be found in the Index Catalogue (1-3 series) and in the manuscript files of the Surgeon General's Library under the headings already given. Brief mention may be made of such outstanding historical studies as those of Billroth on the treatment of gunshot wounds (1859) and of railway transportation of the wounded (1874), of Gurlt on international nursing in wartime (1873), and on 150 years of military medicine in Prussia (1875), of Virchow on the progress of military medicine (1874), and the valuable essays of René Briau

²¹ Dreyer: op. cit

(1866) Auguste Corlieu (1892) Wilhelm Haberling (1910–19) and Andrea Corsini (1916). Sudhoff's Catalogue of the Dresden Hygienic Exhibition (Historical Section, 1911) and his learned study of care of the wounded through the ages (1917) are of basic importance. Meyer-Steineg's admirable essay on Greek and Roman hospitals (1912) contains descriptions and very understandable plans of the Roman military hospitals at Carnuntum and Novaesium.²²

English Sources

The "Notes towards the History of the Medical Staff of the English Army prior to the Accession of the Tudors" (1873) by Sir W. R. E. Smart, R.N., were translated by Frölich, liberally utilized by Knorr, and followed in the historical sketch of A. A. Gore (1879).²³ A good account of the later history of the Army Medical Staff is that of P. A. Young (1898).²⁴ Sir Thomas Longmore's treatise on the transport of the sick and wounded (1868) is rich in historical details, and his study of the medical conduct of the Crimean War (1883) is the best critical summary of the subject. Other valuable contributions are the short history of English military surgery by J. Young (1913),²⁵ H. A. L. Howell on care of the sick and wounded during 1715–48 (1914),²⁶ and Sir Anthony Bowlby's résumé of British military surgery from Hunter to the European War (1919).²⁷ The study of the Moghul campaigns (1909)²⁸ by Col. T. H. Hendley, Indian Medical Service is unique of its kind. The "Medical History" of E. T. Withington (London, 1894) contains three valuable chapters (pp. 74; 115; 221) based upon original research in non-medical writings.

American Contributions

These relate mainly to the history of the Medical Department of the United States Army, including the medical histories of the different wars which have been imposed upon our government. Worthy of especial note are:

BROWN (HARVEY E.): The Medical Department of the United States Army from 1775 to 1873. 8°. Washington, 1873.

BARRIGER (JOHN W.): Legislative History of the Subsistence Department of the U. S. Army, 1775–1876. 8°. Washington, 1876.

HAMERSLEY (T. H. S.): Complete Regular Army Register (1779–1879) 8°. Washington, 1880, 351–379.

INGERSOL (L. D.): History of the War Department. 8°. Washington, 1880, 210–258.

²² Th. Meyer-Steineg: Jena. med.-histor. Beitr., 1912, Heft 3, 34–45.

²³ A. A. Gore: The Story of our Services under the Crown. 8°. London, 1879.

²⁴ P. A. Young: Edinb. M. J., 1898, n. s., iv, 11–20.

²⁵ J. Young: J. Roy. Army Med. Corps, Lond., 1913, **xxi**, 484–489.

²⁶ H. A. L. Howell: *Ibid.*, 1914, **xxii**, 320; 455.

²⁷ Sir A. Bowlby: Brit. M. J., Lond., 1919, I, 205–212; or: Lancet, Lond., 1919, I, 285–290.

²⁸ T. H. Hendley: Brit. M. J., 1909, II, 374–377.

- HOFF (JOHN VAN R.): *Résumé of the history of the Medical Department, U. S. Army, 1775-1899.* J. Ass. Mil. Surg. U. S., Carlisle, Pa., 1901-02, x, 347-398.
- THIAN (RAPHAEL P.): *Legislative History of the General Staff (U. S. A.) 1775-1901.* 8°. Washington, 1901, 362-439.
- KEAN (J. R.): *The Army Medical Department.* J. Am. M. Ass., Chicago, 1904, xlii, 1216; 1287; 1352; 1418; 1491. [Reprinted.]
- OWEN (WILLIAM O.): *The legislative and administrative history of the Medical Department, U. S. Army, during the Revolutionary War (1776-1786).* Ann. Med. History, N. Y., 1917-18, I, 198; 261; 342. [Reprinted.]
- Chronological arrangement of Congressional legislation, 1785-1917.* 12°. Chicago, 1918.
- DUNCAN (LOUIS C.): *The Medical Department of the U. S. Army in The Civil War.* 8°. Washington, 1914.

The reports of Col. John S. Billings on military medicine in Europe (1882) and of Brig. Gen. Alfred A. Woodhull on the Medical Department of the British Army (1894) are valuable. On the whole, the best piece of original research is that of Col. Charles L. Heizmann on military sanitation in the sixteenth, seventeenth and eighteenth centuries (1893; reprinted 1917)²⁹; which, like the chapters in Withington's History, is based upon data from secular writings and the personal memoirs of great commanders. An accurate, compact, and readable summary of the history of military medicine is that of Col. Weston P. Chamberlain, M.C. (1917, reprinted 1919).³⁰

Histories of Medical Departments of Armies

For those not already mentioned, consult the Surgeon General's Catalogue, first, second and third series, *sub voce* "Army" (and subdivisions).

Medical Histories of Campaigns and Wars

These are of two kinds, viz., personal memoirs and historical narratives by prominent medical officers, usually based upon recollection; and the official histories authorized and published by governments which, in the best examples, are based upon documentation. Examples of the first species are the "Apology and Treatise" of Ambroise Paré (1585), Thacher's "Military Journal" of the War of the Revolution (1827), the military memoirs of the elder Larrey (1812) on the Napoleonic Wars, of Mann (1816) on the war of 1812, of Chenu (1865) and von Hübbenet (1871) on the Crimean War, of Chenu on the Italian and Franco-Prussian Campaigns (1869; 1874), of Pirogoff on the Crimean, Franco-Prussian and Turco-Serbian Wars (1859-79), and such books

²⁹ C. L. Heizmann: J. Mil. Serv. Inst. U. S. Governor's Island, N. Y. H., 1893, xiv, 709-738. Reprinted in: Ann. Med. History, N. Y., 1917-18, I, 281-300.

³⁰ W. P. Chamberlain: Boston M. & S. J., 1917, clxxvi, 479-486. Reprinted in: Smithson. Inst. Rep. 1918, Wash., 1919, 235-249

as Lettermann's Medical Recollections of the Army of the Potomac (1866) and the Personal Memoirs of John H. Brinton (1914). Accurate and painstaking research is evidenced in such studies as those of Friedrich Loeffler on the Danish and Austro-Prussian Campaigns (1864-7; 1868) and of Emil Knorr on the Turco-Servian War (1883), which were prepared under government auspices, and also in the monographs on the Revolutionary, Mexican and Civil Wars by Col. Louis C. Duncan (1914-21), and the above mentioned histories of continental European wars by Paul Myrdacz.

As applied to the formal and official "medical histories" of wars issued by governments, the term "history" is usually a misnomer, since all the larger public documents of this kind are, in the main, made up of compilations of medico-military statistics, analyses of medical and surgical cases, studies of communicable diseases and other professional matters. This is largely true of the official medical histories of the Crimean, Civil, Franco-Prussian and Pan-European Wars. The great Medical and Surgical History of the Civil War, prepared by Woodward, Otis, Huntington and Smart (1870-88), does contain, however, valuable histories of the development of hospital construction, transport and surgical instrumentation, and a remarkable series of personal reports on battles and military operations by individual medical officers, which have been found very useful, even by the secular historians of this war. Up to the European war this latter collection has been unique, for, as we have seen, such battle reports have usually been elsewhere published as individual contributions by the medical officers themselves. Inasmuch as such reports have commonly been written in the past from the pocket diaries and note-books kept by medical officers in campaign, the necessity for careful documentation has latterly arisen, and for the following reasons. "Memory is a sieve," fallible as the human mind itself, and our psychologists have shown, to their own satisfaction at least, that few persons can describe an exciting event exactly as it occurred. Exact or even approximate dates of occurrences are particularly apt to slip their cables, whence careful heads of families were accustomed, in old times, to keep definite records of births, christenings, marriages, deaths and so forth, in the family Bible or private diary.

Newton is said to have forgotten some of his own mathematical discoveries, although he could always, on occasion, give the successive steps which led up to them; Sir Walter Scott is said to have wept on hearing one of his own songs, the authorship of which he had forgotten; and Clerk Maxwell, one of the keenest minds the world has ever known, made some very faulty computations in the kinetic theory of gases, through lapse of memory, at a time when his brain was tired out by

illness and approaching death. Physicians who only remember the approximate dates of articles they have written, or that someone else has written, are constant clients of medical librarians. Separate military reports of the same occurrence by different observers have been found to cross cables as to dates, statistics and close renditions of fact, and some of them have been shot through and through as to reliability when subjected to careful analysis. Documentation from the records, such as is now required by the General Staff for the administrative and non-professional portions of our medical history of the European War is therefore not "a Gaulish and a German thing" but something conditioned by the necessity of bringing history up to scientific standards of accuracy by holding the writer accountable and responsible for his statements. The reason for its existence is contained in the fine distinction made between culture and science by our greatest classical scholar: "Culture is the substance of things which a gentleman has forgotten."

Of actual or prospective medical histories of the European War, three volumes of the German have been published to date and are confined to purely professional and scientific material. As indicated by the prospectus, battle operations and administrative mechanism will not be a feature of this history. The preliminary pamphlets and volumes issued by the Medical Research Committee (National Health Insurance) suggest that the English history will be in the same trend. The medical history of American participation, now very properly entitled "The Medical Department of the United States Army in the European War," will deal with administrative and tactical, as well as professional, material. Under the editorship of Col. Charles Lynch, M. C., two volumes of this history are already in the press.

Lives of Eminent Military Surgeons and Medical Officers

The biographies of Ambroise Paré by Malgaigne (1840), Le Paulmier (1884) and Stephen Paget (1897) are all of extraordinary merit. The recent "Life and Times" by Dr. Francis R. Packard (New York, 1921) contains an excellent translation of Paré's Apology and Journeys, interesting for their grim pictures of war as it was in the sixteenth century. M. Roth's Vesalius (Berlin, 1892) is perhaps the most wonderful of all medical biographies; the illustrated volume by Dr. J. M. Ball (St. Louis, 1910) is excellent and reliable for those who do not read German. The best life of John Hunter is that by Stephen Paget (Masters of Medicine, London, 1897), and the same may be said of Paul Triaire's fine book about Larrey (Tours, 1902), of whom the best account in English is unquestionably that of Dr. J. C. Da Costa (1906).³¹ The

³¹ J. C. Da Costa: Johns Hopkins Hosp. Bull., Balt., 1906. xvii, 195-215.

Prussian surgeons general and other German officers have been well taken care of in the collection of Köhler. The three-volume life of Helmholtz by L. Koenigsberger (Braunschweig, 1902) has been Englished by F. A. Welby (Oxford, 1906). Of Anglo-Indian officers, Sir Joseph Fayrer's *Recollections* (Edinburgh, 1900) is interesting for its details about the Mutiny; his life of Sir James Ranald Martin (London, 1897) and the sketches in the *History of the Indian Medical Service* by Lieut. Col. D. G. Crawford (Calcutta, 1914) are also to be recommended. Of American references, the biographies of John Morgan by M. I. Wilbert (1904), of William Beaumont by Jesse S. Myer (1912), of Letterman by Lieut. Col. B. A. Clements (1883),³² of Walter Reed by Howard A. Kelly (2d ed., 1913), and of George M. Sternberg by Mrs. Sternberg (1920) need only be mentioned. "The Surgeon Generals of the Army" by Major James E. Pilcher (1905), is a standard source of reference. The "Personal Recollections" of Eunice Tripler (privately printed, 1910) is, like the Sternberg biography, a pleasant record of army life by the widow of a celebrated medical officer.

Exhibitions of Military Medicine

Exhibitions of military medicine have been a feature of all international expositions, from the time of the Paris Exposition (1867) and its successors (1878, 1889, 1900) to the Centennial (1876) and the local American expositions at Chicago (1893), Buffalo (1901) and St. Louis (1904). A report on the English exhibit of military medicine at the Paris Exposition of 1867 was rendered by Sir Thomas Longmore. The exhibit illustrating the history of military medicine at the International Hygienic Exposition at Dresden, in 1911, was a new departure. Here the subject was illustrated from the Assyro-Babylonian period to the middle of the nineteenth century by inscriptions, placards, pictures, books and objects of all kinds.

During the World War no less than six historical exhibitions of this kind were held, in Berlin, London, Paris and Washington. The first of these was held in the parliamentary buildings at Berlin in 1914 and followed the Dresden exposition in the tendency of its historical exhibit. In the following year (1915), Dr. Norman Moore exhibited a number of old English texts of military medicine and surgery before the Medical Society of London and a similar demonstration was made to the Royal Medical Society (Historical Section) in the same year. In 1916 an exhibit of pathological specimens from the war was attached to the Historical Museum of the Service de Santé at Val de Grâce, and a similar exhibition by the Royal Army Medical Corps was opened at

³² B. A. Clements: *J. Mil. Serv. Inst.*, Governor's Island, N. Y. H., 1883, iv, 250-287.

the Museum of the Royal College of Surgeons, London, on October 11, 1917. In 1918 an exhibit of books and curiosities of the war was made in the Hall of the Surgeon General's Library under the direction of Col. C. C. McCulloch, Librarian, S. G. O.³³

Medico-Military Periodicals

The titles of the earliest periodicals devoted to military medicine are subjoined in chronological order of appearance in the different countries:

- 1782. France: *Journal de médecine militaire*. Publié par ordre du roi, v. 1-7. Paris, 1782-8.
- 1789. Austria: *Bibliothek der neuesten medizinisch-chirurgischen Literatur für die k. k. Feldchirurgen.*, v. 1-4. Wien, 1789-92.
- 1816. Germany: *Magazin für die gesammte Heilkunde, mit besonderer Rücksicht auf das Militär-Sanitäts-Wesen im königlich-preussischen Staat.* v. 1-24, n.F., v. 1-42. Berlin, 1816-48.
- 1823. Russia: *Voyenno-meditsinskii Journal* [Medico-military Journal] v. 1-240. Petrograd, 1823-1914. [Current at outbreak of European War.]
- 1848. Belgium: *Archives médicales belges*. Organe du Corps sanitaire de l'Armée, Bruxelles, 1848-1921.
- 1853. Italy: *Giornale di medicina militare*, v. 1-32, Firenze, Roma, 1853-84. [continued as: *Giornale medico del Regio Esercito*, Roma, 1885-1921].
- 1864. Spain: *Revista de sanidad militar española y extranjera*, v. 1-4. Madrid. 1864-7.
- 1876. Sweden: *Tidskrift i militär Hälsovård*. Stockholm, 1876-1921.
- Portugal: *Gazeta dos hospitaes militares*, v. 1-8. Lisbon, 1876-84.
- 1877. Holland: *Nederlandsch Militair-geneeskundig Archief*. [Various places], 1877-1921.
- 1891. United States: *Transactions [Journal] of the Association of Military Surgeons*, 1891-1906. Continued as: *Military Surgeon*, Washington, 1907-21.
- 1903. Great Britain: *Journal of the Royal Army Medical Corps*, v. 1-25. London, 1903-21.

Medico-Military Libraries

In 1781 the military hospital at Gumpendorf, Austria, was turned into a hospital school for field surgeons, and provided with a medical library during 1783-5. The Prussian *Pepinière*, for instruction of medical officers (founded 1795), was furnished with a medical library by Surgeon General Goercke in 1798. The Medico-Military Academy at Petrograd (founded 1798) acquired a medical library which was, for a long time, the largest medico-military library in the world (180,000 volumes, with 257 periodicals, and an annual budget of 600 rubles). This collection, once the second medical library of the world, has latterly been out-paced in number of volumes by the Surgeon General's Library. The Library of the Medico-Chirurgical Academy at Dresden (founded 1815)

³³ A full account of these exhibitions is given in *MILITARY SURGEON*, Wash., 1918, xlii, 351-359.

was absorbed by the National Medical Collegium of Saxony in 1864, when the Saxon Army Medical School ceased to exist, but another collection, confined to books on military medicine, was started by a donation of Staff Surgeon Günther in 1853 and was catalogued by Frölich in 1877. The Library of the School of Military Medicine at Val de Grâce (founded 1850) was catalogued (176 pp.) in 1861. The Library of the English Army Medical School at Netley (1860) was founded in 1862, but the collection goes back to the earliest times. The Surgeon General's Library at Washington, now surpassed only by the Library of the Paris Medical Faculty in number of volumes, was, in 1836, a modest office outfit of medical books in Surgeon General Lovell's room, and was developed to its present status (650,000 items) by Col. John S. Billings during his Washington period of active duty in the Army (1865-95), and by his successors. The Index Catalogue of this Library is now in its fortieth volume (1880-1921). The library and reading room of the Scuola d'applicazione di sanità militare at Florence was opened on January 1, 1883.

CHAPTER II

Military Medicine in Antiquity

Prehistoric

In prehistoric time we do not find, do not expect to find, organized armies. Cave man was occupied with hunting, fishing, herding, and such warfare as he made with stocks and stones, flint arrows, spears and axes, was in the nature of hand-to-hand combats with his own kind or with gigantic animals. In these conflicts one principle was forced upon his attention; he won out as much by his wits as by native strength; the best brains were the winning brains. Three great English physiologists have, in fact, devoted their lives to a proof of the proposition that the coordination and integration of the nervous and chemical mechanisms regulating the animal or human organism are the principal factors in its evolution and development. As Gaskell puts it: "It is not size, it is not strength, that has conferred the great advantage in the struggle, but acuteness."

Four paintings exhibited by Paul Jamin in the Parisian Salons of 1885-1903¹ illustrate some of these phases in prehistoric human existence. One represents a number of cave men fighting over a woman; another a group of men fleeing in the snow before an advancing mammoth; a third a group of women and children looking on while a primitive artist executes one of the gigantic mural paintings in a prehistoric cave; a fourth, a savage chieftain, clad in skins, with casque and spear, appalled at the discovery of his wife in the clutches of a lion at the mouth of a cave. All that we know of early man's life is here: his realization of the need of organizing means of defense for himself, his family and his fellows against inevitable catastrophes; lust of power and possession as the cause of war; the evolution of union and cooperation in the defense of a social group against formidable enemies of gigantic size; and the development of the arts by peace. In the face of primitive social forces like these such motives as the *cherchez la femme* in the Trojan and other wars (indicated with frank indecency in the third satire of Horace) dwindle into relative insignificance. Visualize prehistoric man as

¹ Rev. de l'École d'anthrop., de Paris, 1903, xiii, pl. ii, v.

hunting, first singly, an Ishmaelite with his hands against all his fellows, then in couples, then in packs; assume a dispute over spoils of the chase or strayed animals from the herd between two men of different gangs; then an encounter, with eventual participation of all the gangsters. We have at once a primitive instance of Pirogoff's theory of war as a communicable disease, a "traumatic epidemic," not different from what was to happen hundreds of times later everywhere, "from China to Peru," in Scotland or Corsica, or among early settlers and mountaineers in our own country. A sense of the value of organization, discipline and leadership probably arose when the sessile people who cultivated wild wheat on the fertile plains became domesticated and were assailed by the hardy nomadic hunters and herdsmen, whose commissariat of milk and milk products travelled with them. Without organized military forces, the tamed went down before the untamed; *homo domesticus* was overcome by *homo ferus*, with the amusing sequel that wherever a conquering race settled down on conquered territory, they became assimilated to the civilization of the conquered people through inter-marriage with their women. But that even barbaric communities could maintain peace with honor, maintaining their individuality on the Scotch principle,

"Here

Ye maunna think to domineer,"

is evident from the memorable passage in Tacitus about the Chauci, which the great historian intended as an ironical rebuke to the aggressions of imperial Rome:

They are the noblest of the German tribes, and so constituted as to prefer to protect their vast domain by justice alone; they are neither grasping nor lawless; preferring quietude and seclusion, they provoke no wars and dispatch no raiders on marauding forays; the special proof of their sterling strength is, indeed, just this: that they do not depend for their superior position upon injustice; yet they are ever ready with arms, and, if circumstances require, with armies, with men and horsemen in abundance; so, while they uphold peace, their military reputation does not suffer (Germania, 35).

In encounters between West-European barbarians in the historic period it was usually the custom to drag the wounded into safety and shelter, where possible (Tacitus).² But, as we shall see, definite organization for the rescue and care of the wounded has seldom been fostered except by experienced commanders of unique military genius. The great Mongol raids of the Middle Ages, the most devastating on record,

²Of the Germanic tribes, Tacitus says "they carry off their dead and wounded even in drawn battles (*corpora suorum etiam in dubiis proeliis referunt*.—Germania, 6). In the encounter between the Caledonians and Romans, in the Agricola, he tells how the scattered Britons, amid the tribal wailing, began to drag off their wounded and to check up on those unhurt (*Britanni palantes mixtoque virorum mulierumque ploratu trahere vulneratos, vocare integros*.—Agricola, 38).

sweeping all Asia and half of Europe, were characterized by massacre of the enemy's wounded and fatalistic Oriental indifference to their own. These are facts in anthropology.

The evolution of the art of medicine in primitive society is beautifully indicated in the ancient treatise of Celsus as follows:

Some of the sick, on account of their eagerness, took food on the first day; some, on account of loathing, abstained; and the disease, in those who refrained, was more relieved. Some ate during a fever, some a little before it; others after it had subsided, and those who had waited to the end did best. For the same reason, some at the beginning of an illness used a full diet, others a spare, and the former were made worse. Occurring daily, such things impressed careful men, who noted what had best helped the sick, and began to prescribe them. In this way, medicine had its rise from the experience of the recovery of some, of the death of others, distinguishing the hurtful from the salutary things.³

The disease to which prehistoric man was most exposed was arthritis deformans, the "cave gout" of Virchow, which, to an appalling degree, affected alike the primitive inhabitants of Europe and the Egyptians on the banks of the Nile, as evidenced in innumerable prehistoric skeletons and mummies. The Lake Dwellings represent, in some measure, the efforts of the cave men to get above and away from the evil effects of sleeping on the damp ground.⁴

Egypt

In Egypt, the mother of civilization, we find warfare by means of organized armies already a going concern. How recent the "antiquity" of Egypt we may judge by the dictum that if man's existence in space and time be represented by the circuit of a clock from XII to XII, then palæolithic man occupied the complete circuit in time up to XI, neolithic man all that remains up to the last half minute, which small interval represents the 8,000 years in the sublunary existence of historic or "civilized" man and his forbears.⁵ How highly specialized the Egyptian civilization, how much like our own in many curious respects, may be gathered from a glance at some of the exhibits listed in Sudhoffs' Dresden Catalogue:

Celsus: *De re medica*. Proaemium. Cited by Sir William Osler in his *Silliman Lectures* (Yale Press, 1921).

⁴ Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 111-112. Tacitus (*Germania*, 46) describes the Fenni, a Slavic or gypsy tribe, as sleeping on the damp ground (*cubili humus*). In travelling through lower Hungary in 1814, Dr. Richard Bright (of Bright's disease) found the same people living in dugouts:

"Now I believe the Troglodytes of old,
Whereof Herodotus and Strabo told,
Since everywhere, about these parts in holes,
Cunicular men I find and human moles."

Bright: *Travels from Vienna through Lower Hungary*. London, 1818, 615.

⁵ B. Holmes and P. G. Kitterman: *Medicine in Ancient Egypt*, Cincinnati, 1914, 7.

e. g., baking bread; a market, with separate stands for fish, vegetables, etc.; brewing beer; making a fire with bellows; people in bed; cosmetics, toilet articles and vanity sets; a barber clipping hair; razors; a bath-room; accouchement of queen by four midwives; clitoridectomy; wrestling matches; secretaries taking dictation; ship-building; a transport barge or lighter; four statues of physicians; and (220 B. C.) complaint of a Greek lady to Ptolemy on being parboiled in a public steam bath.⁶ A box of Egyptian toys, recently excavated from a tomb by the Metropolitan Museum of Art, contains a model bakery, stable, carpenter's shop, slaughter-house, etc.⁷

Life in this antique world was organized about as follows: At the top were the learned class, with the temple as the repository of records and center of knowledge. Lower down were the farmers, herdsmen, merchants and artisans, with a great mixed substratum of servants, slaves, gang-laborers, mercenary soldiers and sailors. From the primitive concept of chief priest as tribal leader and medicine-man was presently evolved, through division of labor, a military leader or king, with subaltern commanders and warriors, as the defensive arm;⁸ and later another class, the physicians who were already specialists, in that each applied himself to diseases of one part of the body only. The military monarch was eventually elected to godhead and was often at odds with the priests in consequence. Egypt was essentially a matriarchal civilization, paying great regard to maternity insurance and child welfare. Each district of the country had a military guard of its own, with arsenals or barracks, and these guards were, in time of war, consolidated into an army, strengthened by mercenary negro troops from the south. Of their medical service in campaign, Diodorus Siculus relates (i, 82):

On campaigns or other expeditions out of the country, the sick are treated without cost to themselves; for the physicians receive compensation from the state and practice medicine from a formulary compiled by many learned hands. If, following the prescriptions of this sacred book (Embre), they fail to save the patient, they are absolved from all guilt; but if they run counter to its directions, they are put to death; for the lawgiver opined that few physicians are more competent than a system tested by time and compiled by the best.

As to the organization of the medical profession in Egypt, both Homer and Herodotus are in agreement. In the *Odyssey* (iv, 231-232) occurs the verse:

"There every physician excels all other men in [his particular] knowledge; for truly, they are of the race of Paeon."⁹

⁶ Sudhoff: Internationale Hygiene-Ausstellung, Dresden, 1911, i, Historische Abteilung, 34-41 (items 1101-1632).

⁷ Forbin: Les jouets dans la tombe. Nature, Paris, 1921, 53-59.

⁸ H. G. Wells: Outline of History. London, 1921, i, 149-162.

⁹ Frölich cites the Voss translation of this Homeric verse, with the reading—

"Dort ist jeder ein Arzt und übertrifft an Erfahrung
Alle Menschen: den wahrlich sie sind von Geschlechte Paeons."

which is erroneous. If we may trust Herodotus, the essential feature of Egyptian medicine was a specialist for every disease or group of diseases, while every man as a self-appointed doctor (*jeder ein Arzt*) was characteristic of Assyro-Babylonian medicine.

Herodotus says (ii, 84):

The art of medicine is thus divided among them; each physician applies himself to one disease only, and not more. All places abound in physicians; some are for the eyes, others for the head, others for the teeth, others for the parts about the belly, and others for internal disorders.

The Egyptians were natural chemists and had a most extensive pharmacopœia, with weighing of drugs by the balance; but their extreme specialism of "a doctor for every disease," or at least for each part or region of the body, could only result in haphazard therapy. The Ebers Papyrus (1550 B. C.) shows them at their best in their knowledge of the hookworm and other parasitic affections, of diseases of the eye and ear, of the treatment of tumors and abscesses by the knife, and of the art of embalming. Trephining was common, as among all ancient and primitive peoples. Larrey, in his *Memoirs*, states that the mural paintings and bas-reliefs in the temples at Karnak, Luxor, etc., afford abundant evidence of the methodical practice of surgery by the ancient Egyptians.¹⁰ Circumcision and other phases of genito-urinary surgery are clearly depicted on a tomb at Saqqarah, near Memphis (2500 B. C.). Egyptian surgery was essentially external and rudimentary; their knowledge of anatomy was small. The instruments found are usually of the Bronze Age; but Plate II in the great album of Lepsius represents sword-blades, spear and arrow points as painted blue, which suggests perhaps some knowledge of the tempering of iron into steel (Frölich). The mummies excavated in Nubia in 1907, prior to the flooding of the Assuan Dam, show splinting of fractures by means of palm-fiber bandages, with surprisingly good results and little shortening.¹¹ This technique was the origin of the art of bandaging, which was highly elaborated by the Greeks and Romans, and to which Oribasius (325-403 A. D.) devoted no less than seventy chapters. A stele of the Eighteenth Dynasty (1580 B. C.) in the Carlsberg Glyptothek (Copenhagen) shows the use of a crutch in an obvious case of poliomyelitis. The mummies show that syphilis, cancer and rickets were non-existent, teeth were uniformly good and free from caries, rheumatoid arthritis was of staggering frequency from youth to old age, even in the latest dynasties, while Pott's disease (21st Dynasty, 1000 B. C.), spondylitis deformans, gout, malarial spleen, atheroma of the arteries, mastoid disease, pleural and visceral adhesions, necrosis and cranial injuries from blows and sword-strokes have been found.¹²

¹⁰ D. J. Larrey: *Mémoires de chirurgie militaire*, Paris, 1812, ii, 223.

¹¹ For photographs of which, see G. Elliot Smith and F. Wood Jones: *The Archaeological Survey of Nubia*, Cairo, 1910, Atlas to Vol. ii, *passim*.

¹² Elliot Smith: *op cit.*, Vol. ii; also Sudhoff: *Dresden Catalogue*, 1911, 52-53 (items 1633-1715).

Sumer and Akkad

(Assyro-Babylonian Civilization)

Between the Tigris and the Euphrates lay the ancient "kingdom between the rivers" (Mesopotamia), originally occupied by the mysterious Sumerians, the originators of our decimal system of notation, our ordinary divisions of time, and the art of writing on clay tablets. On account of their enormous wheat yield (Herodotus, i, 193), these fertile plains were to be the seat of endless wars, in the course of which a mighty civilization of some 5,000 years standing was gradually built up. The Sumerians were conquered by the Semitic Akkadians under Sargon (2750 B. C.), but, in keeping with the anthropological law of Lapouge,¹³ the conquerors were assimilated by the conquered people, and the old Sumerian culture prevailed. In 2100 B. C. all Mesopotamia was mastered by the Amorites under Hamurabi, whose capital was Babylon. Babylonia then fell successively under the domination of the Assyrians under Tiglath Pileser I and III (1100 B. C.; 745 B. C.), with an additional capital at Nineveh; of the Medes and Persians under Cyrus (539 B. C.); and of the Greeks under Alexander the Great (331 B. C.).

In spite of this constant change of military masters the Assyro-Babylonian culture continued to have a natural growth and development up to its inevitable decadence. These wonderful people did much for the development of astronomy, had splendid drains and sewers,¹⁴ stone privies, slipper-shaped coffins and fan-shaped tombs, an organized system of wet-nursing, long lists of injurious insects and parasites, parasols against the heat, fly-flaps against insect pests, hollow tubes for sipping beverages, water-wings to teach swimming,¹⁵ and knew the Australian crawl. They had a highly organized military service, with chariots, archers, light cavalry and infantry tactics in close phalanx formation. As their imposing bas-reliefs indicate, a large part of the service of their defensive arm was taken up with organized warfare on wild animals. In prehistoric times the larger animals of the cat family were plentiful all over Europe, as well as in Asia and Africa. Lions existed in Germany up to the Neolithic period, in the Balkans up to the fourth century B. C., while the panther was common in Greece, Southern Italy and Spain up to 1000 B. C., and was usually figured in Bacchic processions on Greek pottery of the later periods. Extermination

¹³ "La terre est restée partout aux descendants de ceux qui la cultivaient et ne garde plus que les os de la race supérieure qui l'ensanglantait." G. de Lapouge: *Rev. d'anthrop., Par.*, 1887, xvi, 524.

¹⁴ For the sewerage and water-supply of the cities of antiquity, see H. A. Nielsen: *Arch. f. Hyg., Berl.*, 1902, xliii, 85-115.

¹⁵ Sudhoff: *Dresden Catalogue*, 1911, 21-28 (items 601-1047).

of these beasts was effected, not by change of climate but by man.¹⁶ Some of the finest and most realistic of the Assyro-Babylonian bas-reliefs represent lions transfixes by spears, in the agony of death, with spirited scenes of the destruction of wild beasts by archers and spearmen in chariots or on horseback. The demons of Assyro-Babylonian mythology were usually represented as lion-headed. An ancient carved limestone pillar of the Sumerian period (2920 B. C.), found at Telloh and known as the Stele of the Vultures, shows helmeted warriors with extended spears marching in phalanx formation over the bodies of their enemies; another detachment with spears at "right shoulder arms," headed by the king in a chariot; the god Ningirsu capturing the enemies of Lagash in a net; the burial of the soldiers of Eannatum in a common trench, with policing of the battlefield by vultures.¹⁷

An Assyrian bas-relief shows the transportation of a gigantic stone image by gang laborers hitched to a truck and urged on with whips. A bas-relief from Nineveh shows a walled camp, with drinking, bed-making and slaughtering of animals in tents.¹⁸

The essential features of Assyro-Babylonian medicine were a demon for every disease (our disease germs), prognosis by liver inspection and therapy by exorcism and herbal remedies. Contagion was seizure by demons; incantation was prophylaxis. Conjurations against mosquitoes have been found, and the symbol of Nergal, the Mesopotamian god of disease and death, is a fly. The ancient Babylonian custom characterized by Montaigne as "the whole people as physician" is given in Herodotus (i, 80):

They bring out their sick to the market place, for they have no physicians. Then those who pass by the sick person confer with him about the disease, to discover whether they have themselves been afflicted with the same disease as the sick person, or have seen others so afflicted; thus the passers-by confer with him, and advise him to have recourse to the same treatment as that by which they escaped a similar disease, or as they have known to cure others. And they are not allowed to pass by a sick person in silence, without inquiring into the nature of his troubles.

This Main Street variety of communal medicine and group diagnosis implies, however, that some of these self-appointed physicians were more highly skilled than the rest. As a matter of fact, a number of letters by court physicians to Assurbanipal (884-860 B. C.) on clinical cases have been deciphered. In the Code Hamurabi (2250 B. C.) the statutory fees of physicians are carefully indicated in particular cases, as also the penalties for malpractice; e.g., in setting a fracture or operating for cataract. Like Egypt Babylonia was a matriarchal

¹⁶ Sir H. H. Johnston: footnote to p. 192 of Wells' Outline of History, Lond., 1921, i.

¹⁷ For a reproduction of this stele, see Morris Jastrow: The Religion of Babylonia and Assyria. Phila., 1915, pl. xlvi-xlvii.

¹⁸ Sudhoff: Dresden Catalogue, items 758-760.

civilization, and there are no comelier figures in sculpture than those representing the mother-goddess Ishtar suckling a child. The rights of wives, widows and children, including orphans and adopted children, were scrupulously protected by severe penalties in the Hamurabi Code.

The caduceus as the symbol of the Mesopotamian god of fertility (Ningishzida) is found on a green steatite vase from Telloh (4000-3000 B. C.), now in the Louvre. This symbol was later assimilated by the Greeks as the emblem of Mercury, the god of commerce, and by the Romans as a badge of secrecy and neutrality, with a special herald, the *caduceator* or peace commissioner, for the conduct of peaceful negotiations in war time. Varro called the caduceus "the symbol of peace,"¹⁹ and the fact that it connotes transactions of this character probably led to its adoption as a symbol of the non-combatant status of the American medical officer and his rights in the zone of advance in war-time, under the Geneva Convention.²⁰

As in Greece or Rome, there were elements of darkness, blood-guiltiness and cruelty in Egypt and Babylon, but probably not more than in the extensive holocaust of religious martyrs and free-thinkers in the sixteenth century, or, scattered over a wider surface, on the police-blotters of the larger cities of the world today.

Israel

The wars of the Jews occupy no inconsiderable portion of the Old Testament, the Apocrypha and the writings of Josephus; the Hebraic contribution to military hygiene is an essential part of their remarkable work in the early development of preventive medicine. In connection with the sojourn in Egypt and the Babylonian Captivity (587-537 B. C.), the Hebrews undoubtedly acquired much from these ancient civilizations and were perhaps influenced in a later period by the convection of culture from Greece. In the modern view Moses, as the hygienic shepherd of his people (*circa* 1491 B. C.), is only a symbol for the finished product of Sumerian-Semitic cult-hygiene (as set forth in the Pentateuch), after a long period of gradual development. Circumcision was originally a primitive ethnic (Egyptian) rite,²¹ like clitoridectomy, "which to date has not been proclaimed a hygienic measure;" and "even ritual uncleanness of women under special circumstances is ancient property of Greece" (Sudhoff).²²

But the Hebrews did do a number of very important things for the

¹⁹ "Caduceus pacis signum." Varro: *De vita populi Romani*, lib. ii.

²⁰ F. H. Garrison: *Bull. Med. Library Assoc.*, Balt., 1919, ix, 13-16; also, *MILITARY SURGEON*, Wash., 1919, xlv, 633-636.

²¹ *Jewish Encyclopaedia*, N. Y., 1903, iv, 96-97.

²² Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 114.

ethical and hygienic well-being of civilized man which cannot be attributed to Sumer and Akkad. First of all the best features of their moral code, whether of the Old or the New Testament, are intimately connected with clean living and constitute a touchstone of all ultimate refinement of human character. Their prophets developed that spirit of outspoken indignation against social injustice which Wells calls "the free conscience of mankind" and which, however latent or apparent in Æschylus and Sophocles, was a new thing in antiquity and was not a salient trait of the Hellenes. They introduced the weekly day of rest as a splint for overworked humanity, a hygienic idea of fundamental importance, and they early recognized certain diseases as communicable and took effective measures to prevent them. The book of Leviticus (xiii-xv) is thus the basic text of a phase of preventive medicine which was absolutely unknown to the Greeks. The Jewish priests were true hygienic police, supervising the segregation of lepers and venereal carriers, but physicians were a class apart, and there is no evidence that priests ever attended individual cases of illness. In the Assyro-Babylonian cult, as Sudhoff tells us, "whoever was defiled by *issubu* (leprosy) was banished into the wilderness . . . but in the Old Testament (Leviticus xiii), we have the methodic investigation of the leper by the priest, who, according to the diagnosis, isolated the patient temporarily, or permanently."²³ The external signs of leprosy are given in minute detail in verses 2-44; an ascertained leper was expelled from the community (44-46), condemned to civil death, his clothes were burned, if contaminated (47-52), or washed, if not (53-59), while a suspected house was closely examined and, if contaminated, was destroyed (Lev. xiv, 34-53). The fifteenth chapter of Leviticus, dealing with the "uncleanness" of men and women "in their issues," exacts the same rigid regimentation in cases of urethritis (gonorrhœal or other). The plague of Baal Peor, caused by sexual intercourse with the Midianitish women (Numbers xxv), was followed by a Sicilian Vespers of Midianites, which, after the fanatical fashion of antiquity, was extended to all males and to all females who were not virgins (Num. xxxi). "Purification" (disinfection) in the Mosaic ritual was accomplished by the use of fair water, or by a mixture of "cedar wood (juniper), scarlet and hyssop," or by actual incineration (Lev. xii-xv, *passim*).

In the sanitary regulation of diet and water supply Leviticus xi and Deuteronomy xiv are again extraordinarily forward. Prehistoric and primitive man, like the infant, was apt to swallow everything that seemed edible, with the same untoward results which Celsus noted in the evolution of dietetics in disease. The Mosaic code pronounced as

²³ Sudhoff: *op. cit.*, 115.

edible all ruminant animals with cloven hoofs (herbivora), all fish with fins and scales, all birds not feeding upon carrion, while ordinary ungulates and tardigrades, poisonous fish (devoid of fins and scales), all creeping things (reptiles and batrachians) and all unclean birds were rigorously prohibited, as also any water touched by their carcasses (Lev. xii, 3-13). Fat and blood were taboo (Lev. vii, 26; xix, 26), and it was forbidden to "eat of anything that dieth of itself" (Lev. xi, 9) or "any flesh that is torn off beasts in the field" (Exodus xxii, 31). Water or utensils contaminated by dead or unclean animals could not be used (Lev. xi, 32-39), and any open, uncovered vessel in a tent containing a corpse was regarded as unclean (Num. xix, 14, 15).²⁴ Here, then, we have a highly effective scheme of sanitation for hot climates, which was never observed or recorded by the Greeks and the Romans. The same intelligence and forethought is apparent in the remarkable passage in Deuteronomy (xxiii, 9-14) on the policing of a military camp:

9. When the host goeth forth against thine enemies, then keep thee from every wicked thing.

10. If there be among you any man that is not clean by reason of uncleanness that chanceth him by night, then shall he go abroad out of the camp, he shall not come within the camp.

11. But it shall be, when evening cometh on, he shall wash himself with water; and when the sun is down, he shall come into the camp again.

12. Thou shalt have a place also without the camp, whither thou shalt go forth abroad;

13. And thou shalt have a paddle upon thy weapon; and it shall be when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee;

14. For the Lord thy God walketh in the midst of the camp, to deliver thee and to give up thine enemies before thee; therefore shall thy camp be holy; that he see no unclean thing in thee, and turn away from thee.

Austere rulings of the same kind obtained for the enforcement of exogamy and the punishment of sexual perversions, incest, bestiality, and adultery (Lev. xviii; Exodus xxii-xxiii), and these chapters are the literary origins of medical jurisprudence.

The census of the people by Moses (Num. i, 1-4, xxvi, 1-65) and by Joab at the instance of David (I Chronicles, xxi, 3-7) had the usual military significance, viz., to ascertain the available man-power of the nation for war.

In the Babylonian Talmud (352-427 A. D.) the presence of an infectious disease in a community was announced by a warning blast of the shofar, but in the case of diphtheria (*eschara*, εσχάρα) this was done directly the first case was located, on account of the fatal incidence of

²⁴ For a readable account of Mosaic hygiene see the book by Capt. Percival Wood, R. A. M. C., entitled, "Moses, The Founder of Preventive Medicine." London, 1920.

the disease among infants and children.²⁵ The Talmudic regulation of meat inspection, in connection with the slaughtering of animals, was an extension of the Mosaic cult of "clean" (*kosher*) and "unclean" (*trepha*). It is highly probable, as Sudhoff maintains, that the hygienic supervision of meat diet owes its origin to primitive altar practices, i. e., the determination of what rejects of sacrifice were fit to be eaten or otherwise, and from this "sacrificial anatomy" (*Opferanatomie*) the culinary or "butcher's anatomy" of the Middle Ages was also derived. The autopsies made in the Hebrew ritual, after the *Schächter* had slaughtered the animal, were destined, incidentally, to be the source of many observations in comparative pathology in the Talmud,²⁶ indeed, the only recorded observations in gross pathology before the time of Benivieni and Vesalius. The curious awe and fear of the dead human body, which is characteristic of early and primitive peoples everywhere, prevented the ancients from doing any scientific work in human anatomy and pathology, even as the second commandment interdicted the art of sculpture among the Jews.

The strong prejudice of antiquity against the opening of the human body, living or dead, is conveyed to us with sly humor by Celsus. The passage is worth quoting in full as showing just how the ancients acquired their slender knowledge of human anatomy:

Nor can anything be more absurd than to suppose the part to be the same in a dying man, nay, already dead, as it is in a living person. The abdomen may be laid open, it is true, even while the man is breathing (which does not strictly bear on the case); but as soon as the knife has separated the praecordia and the diaphragm, the man immediately expires; consequently, the praecordia, and all the viscera, present the same appearances to the slaughtering physician as those of a dead person, not such as they were while he lived; therefore the only object attained by the physician is that of murdering a man cruelly; not that he can ever ascertain their nature and functions as we have them in life; yet if there be any interesting phenomenon to be subjected to the view in the man as yet breathing, practitioners have frequent opportunities of meeting them by accidents; for sometimes the gladiator in the arena, a soldier in the field, or a traveller intercepted by banditti, is wounded in such a manner as to display some of the interior parts, and so, other parts in other persons. Thus the prudent physician discovers their structure, relative position, arrangement, figure and the like, not by perpetrating murder, but in endeavoring to restore health; and learns by compassion what others have discovered by unrelenting cruelty. And for these reasons [I consider it] unnecessary to lacerate even the dead, which, though not cruel yet may be disgusting; since most things are found very different in dead bodies; even the dressing of wounds themselves may show all that can be discovered in the living.²⁷

²⁵ J. Preuss: *Biblisch-talmudische Medizin*. Berlin, 1911, 179.

²⁶ C. D. Spivak: *Jewish Encyclopaedia*. N. Y., 1904, 412-413.

²⁷ Celsus: *De re medica. Proaemium*. Transl. by A. Lee, London, 1831, 13-14.

India

In ancient India medicine was a matter of incantations against disease and injury, with a certain amount of herbal therapy. The quality of this primitive medicine may be sensed from a few of the titles of hymns in Professor Whitney's Atharva Veda, e. g.:

Against obstruction of urine, with a reed; against leprosy, with a healing herb; for welfare and long life of an infant; against worms; a blessing on the kine; to avert the ill omen of a twinning animal; for recovery of virility, with a plant; against the poison of a poisoned arrow; to heal serious wounds, with an herb; for deliverance from unseen pests; for successful pregnancy, with an amulet; against harm from improper food; to get rid of cough; to make a certain man impotent; against poison of insects and snakes; against intermittent fever, etc.

As apparent from the above, the treatment of wounds in war is mentioned even in the earliest Vedic hymns, the epics (Ramayana), and the medical texts. In the medical treatise of Susruta (4th Century, B. C.) there is a chapter on "the mode of preserving the life of a king whose soldiers are on the march," from which the following paragraphs may be quoted:

A common practice of the enemy under such circumstances is to poison the wells on the roadside, the articles of food, the shades of trees (shadowy places) and the fuel and forage for cattle; hence it is incumbent on a physician marching with the troops, to inspect, examine and purify these before using any of them, in case they be poisoned.

Physicians conversant with the curative virtues of drugs and minerals, and priests well versed in the Vedic Mantras, should jointly protect the king from death, whether due to idiopathic (Doshaja) or extrinsic causes.

The death of a king usually leads to a political revolution or to popular disturbances and brings about a confusion among the vocations of the different orders of society. The growth of population markedly suffers through such catastrophes.

A physician, fully equipped with a supply of medicine, should live in a camp not remote from the royal pavilion, and there the persons wounded by shafts of arrows or any other war projectiles, or suffering from the effects of any imbibed poison, should resort to him (the physician), conspicuous like a triumphant ensign for his fame and professional success. A physician, well versed in his own technical science, and commanding a fair knowledge of other allied branches of study as well, is glorified by his kind and the Brahmanas, and is, like a banner of victory, an ennobling ornament to the state.

The (proper) medicine is that which consists of drugs grown in countries most congenial to their growth, collected under the auspices of proper lunar phases and asterisms, and compounded in proper measures and proportions, and which is pleasing (exhilarating to the mind) and has the property of subduing the deranged bodily humours without creating any discomfort to the patient, and which is harmless even in an overdose, and is judiciously administered at the opportune moment.

That person alone is fit to nurse or to attend the bedside of a patient, who is cool-headed and pleasant in his demeanour, does not speak ill of anybody, is strong and attentive to the requirements of the sick, and strictly and indefatigably follows the instructions of the physician.²⁸

²⁸ Sushruta Samhita, English translation by K. L. Bhisnagratna. Calcutta, 1907, i, 303-307.

Indian medicine reached its height in the period 327 B. C.-750, A. D. the period of Buddhism, which became the creed of India under King Asoka (264-227 B. C.). In 255 B. C. Asoka conquered Kalinga, acquired dominion over the vast peninsula of Hindustan, renounced war, converted his subjects to Buddhism, and ruled for twenty-eight years "in light and gentleness." (Wells.) He had innumerable wells dug, great shade-trees planted, founded botanic gardens for the cultivation of medicinal herbs and, as a rock-inscription records, erected hospitals, both for men and animals. Buddhism was more favorable to the arts and sciences than the narrow caste prejudices and sterile formalities of Brahmanism. In 161 B. C. a dying monarch records that he established hospitals in eighteen different places. The Indian materia medica, dietetics, surgery, with the rules for the hygiene and nutrition of infancy were the best in this period of antiquity. The surgical instruments, over 120 in variety, were well sharpened as to edge and point, and every important operation was done except the ligation of arteries. The Hindu methods of rhinoplasty and cataract excision were carried all over Europe by the wandering surgeons of the Middle Ages. The Indian mode of splinting fractures with bamboo withes was adopted in the British Army as the "patient rattan cane splint." The soporific effects of opium, hyoscyamus, and cannabis indica were known. Hypnotism was also employed in surgical operations. Surgery was taught by having the students practice swiftness and surety of incision upon gourds, melons, lily stalks, etc.; bandaging was practised upon flexible models, and venesection was learned by puncturing the veins of large green leaves. The Hindus were aware that mosquitoes were somehow associated with the transmission of fevers, that when rats fall from the rafters, jump about and die, bubonic plague is at hand. Mosquito nets were used on the Coromandel Coast. Diabetes was recognized by the Indian physicians as *Madhumeha* (honey-urine), while the syndrome of sweetish urine, thirst, foul breath, and debility was recognized later by the Arabians. There is abundant evidence that the Indian and Arabian physicians were specialists in diabetes and hepatic disorders.

Hellas

With the exception of the Spartan State, the Greeks were a brave and warlike rather than a strictly military people. Greece was a loose federation of independent city states, each with its own peculiar religious ideas and form of government. Scattered on the innumerable islands and peninsulas and separated (in the hinterland) by abrupt mountain walls, these city states were frequently at odds with one another, but united on occasion against a common enemy (Confederated

Hellas). Here they showed unparalleled courage, devotion and patriotism, but their real contribution was the development of liberty of thought in mankind. They were the most intelligent people the world has ever seen, never equalled since in their achievement in art and science, including the purest strain of medicine we know.

To understand the Greeks, to know why they are to be placed above all other peoples, one may well consider the illuminating appraisal furnished by Professor Gilbert Murray for Wells' Outline of History. Their outer political history, he points out elsewhere, "like that of all other nations, is filled with war and diplomacy, with cruelty and deceit," but with almost no experience or material resources, with "clothes like Polynesians," with poor tools and no instruments of precision, they boldly ventured upon new and untried paths, like some penniless, friendless youth of genius who does great things unawares.

The greatness of Greece comes out only in the art and literature and thought. . . . Also, an actual achievement in social life—what one calls "Hellenism," i. e., republicanism, simplicity of life, sobriety of thought, almost complete abolition of torture, mutilation, etc., and an amazing emancipation of the individual and of the human intellect. It is impossible to speak, really, of the "Greek view" of anything. Because all the different views are put forward and represented. . . . The characteristic is that *human thought got free*. . . .²⁹

It is a remarkable fact that the Greeks of highest genius, including every one of their greatest physicians, came from the coastwise colonies of Ionia and the outlying islands. While Pericles, Themistocles, Sophocles and Phidias were seafronting Athenians and Æschylus and Thucydides came from Attica, Plato and all the great philosophers before him were Ionian islanders, as also the other men of outstanding ability.³⁰ This is readily understandable when we consider the known passion of island, coastwise, seafaring and mountaineering peoples for personal, intellectual, political and spiritual liberty. The Ionians were, as Albutt says, "the young light-hearted masters of the waves,"³¹ whose modes of thought were

"Something afar from a pious and puny life,
Something escaped from the anchorage and driving free."

Ethnically, the Greeks were made up of a dominating element of Nordic strain, the original Dorian invaders of the North who produced the splendid warriors and athletic prizemen, and a smaller, darker,

²⁹ Wells: Outline of History. London, 1921, i.

³⁰ For the long list of Ionian physicians and philosophers, see Allbutt: Greek Medicine in Rome, London, 1921, 83-112.

³¹ Matthew Arnold: The Scholar-Gypsy.

Mediterranean or Neolithic race, of livelier imagination and, at the same time, of more superstitious mentality, "afraid," as Wells says, "of the stars and of life." From this fusion there came to be two distinct and separate phases of Greek medicine, the one harking back to primeval superstitions connected with theurgy, Chaldean astrology, the gods of the underworld, Thessalian charms, magic and charlatanry; the other forward-looking, keen-sighted, absolutely rational, and, aside from an inveterate passion for speculation, scientific in tendency.

In the island of Crete, some three or four thousand years before Christ, there existed a civilization extraordinarily advanced in many respects, which illustrates this dualism. The excavations made by Sir Arthur Evans suggest a culture as elaborately specialized as those of ancient India or Japan. The porcelain figures of the mother goddess, with her votaries, clad in gowns of amusingly modern cut, grasp serpents with outstretched arms, like Hopi Indians "making medicine." On the other hand, the ventilation, sewage piping, bathrooms, stone water-closets³² and other sanitary arrangements of the palace at Knossos (the Cretan Labyrinth) are said to excel anything of the kind before the nineteenth century. Knossos fell before the northern invaders about 1400 B. C., and it is now assumed that the leading motive in the Trojan War is the usual *fable convenue*, superimposed upon the main events of the general Dorian invasion, about which the Iliad and other ancient epics were built up.

In the Iliad and Odyssey of Homer, the most splendid of all folk epics, we have, at one and the same time, the view of epidemic diseases as visitations of the wrath of the gods, of the necessity of human sacrifice to placate the spirits of the uncremated dead, alongside of a war surgery of absolutely rational type. There is only one passage in Homer (Odyssey xix, 456-457) in which a charm or incantation is chanted over a wound, and its object, to check hæmorrhage, was, curiously enough, the object of scores of similar folk charms in the Dark and Middle Ages. Frölich, who wrote under the spell of Schliemann's excavations in the Troad, was ridiculed by some of his contemporaries for making an elaborate statistical tabulation of the war-wounds in the Iliad; but, if we reflect that no less than 147 wounds are recorded in the great epos, his percentages are at least as reliable as what the mathematical laws of probability would obtain from 147 throws of dice. Of these 147 wounds, 106 were spear wounds, with a fatality of 1 out of every 1.25 cases; 17 sword thrusts, with total mortality; 12 arrow wounds with 1:2.4 mortality; and 12 wounds from stone-slugs with 1:1.5 mortality.

³² For an account of which see the article by Capt. T. H. M. Clarke, R. A. M. C., in Brit. Med. Jour., Lond., 1903, ii, 597-599.

The total mortality was 114 or 77.6 per cent, and of these fatalities 31 were head wounds, 13 injuries of the neck, 67 chest wounds, 10 and 11 wounds of the upper and lower extremities respectively. This is about what we should expect from wounds with *armes blanches*, with no operative treatment. As shown by Frölich's tabulation, the relative percentile frequency of the Homeric wounds in different localities as compared with the incidence of his own time (1879) was: Head 21 per cent: 7 per cent; neck 11:2; chest 54:21; upper extremities 7:26; lower extremities 7:44.³³

The old Ionian word for physician (*ιητρος*), as employed by Homer, meant originally "an extractor of arrows." The war surgery of the Iliad was what the mediæval peoples called wound surgery—i. e., expectant treatment of wounds—and was carried out by a number of regular surgeons (Iliad xiii, 213; xvi, 28), and by certain warrior chieftains (Machaon, Podalirius, Achilles, Patroclus, Agenor) who were adept in wound treatment. The battle formation described in the Iliad (iv, 297) was of the phalanx order, with infantry in the rear, horsemen and charioteers in the front line, and "cowards in the middle." Battles began with individual skirmishing and trial combats, the horse and chariots going to the rear before an infantry assault, but taking the front line in a general advance. After the fashion of primitives, a wounded hero was dragged or borne out of danger by his comrades, sometimes placed under a tree to die (v, 693), but was usually taken to a chariot (xiv, 429), which bore him to the *klisia*³⁴ or hut-like barracks near the black ships (xi, 517; 834). Here he was given a stimulating draught of wine, the "wound-drink" of the Middle Ages (xiv, 5), his clothing was loosened in the region of the wound (iv, 215), which was then washed with warm water (xi, 829; xiv, 6-7) and, if necessary, further examined (iv, 190). An imbedded spear or arrow-point was either withdrawn (v, 112; 693) or cut out by widening the wound (xi, 844). The wound was then treated with various herbs relieving pain (iv, 191, 218, etc.) or with the juice of some bitter root (xi, 846), and finally bound up with a woolen bandage (xii, 599). In one instance, Machaon sucks out the blood after extracting an arrow from Menelaus (iv, 218),³⁵ a practice which was to survive even down to the days of the "wound-suckers" who followed duellists in the eighteenth century.

A fair specimen of this wound surgery is the treatment of the arrow wound of Eurpylus by Patroclus (xi, 834-847):

³³ Frölich: *Die Militärmedizin Homer's*. Stuttgart, 1879, 58-60.

³⁴ Usually translated "tents," but, as Frölich shows, these "tents" are always described as "well-built" and were in fact, constructed of hewn lumber, with thatched roofs. A closer translation would probably be "huts."

³⁵ Frölich: *op. cit.*, *passim*.

He said, and having laid hold of the shepherd of the people under his breast bore him to the tent, and his attendant, when he saw him, spread under him bulls' hides. There Patroclus, laying him at length, cut out with a knife the bitter sharp arrow from his thigh, and washed the black blood from it with warm water. Then he applied a bitter pain-assuaging root, rubbing it in his hands, which checked all his pangs; the wound, indeed, was dried up and the bleeding ceased.

Legendary as all this is, it was about the standard procedure followed in ordinary wound treatment up to the changes necessitated by the introduction of firearms in the Middle Ages.

The epidemic visited upon the Grecian host by the wrath of Apollo, attacking both mules and men, was probably dysentery, which has been endemic in the Mediterranean basin for centuries, was described by Hippocrates, and in 1915 "destroyed mules and many thousands of our men in Gallipoli, just across the Hellespont from Troy" (Edgeworth).³⁶

The next most important sources for the military medicine of the Greeks are the writings of Hippocrates and Herodotus, and of the dim and distant background which these great names imply, Sir Clifford Allbutt says in his "Greek Medicine in Rome:"

It is no barren fancy to associate the Father of Medicine in our imagination with the Father of History. Both inherited the luminous Ionian mind; and the author of *Airs, Waters and Places*, cradled on the same enticing seas, had likewise travelled widely and observed shrewdly; both saw common things under the species of a large humanity. Indeed, the Hippocratic scriptures themselves thus testify to some great school and tradition of medicine, which, sown and watered in a forgotten and unrecorded past, bore ultimately its golden fruit in the great master himself, and onwards in Aristotle and the scientific schools of Alexandria.³⁷

Over five hundred years intervened between the time of Homer and the advent of Hippocrates, whose authentic writings are, in effect, a summation of what was accomplished by Greek medicine in this long period of "silence in the records." Open the true Hippocratic canon almost anywhere and you will light upon clean-cut reasoning like this, sentences which we, 2400 years later, are pleased to regard as "modern" in tendency:

PHYSICIANS AS GOOD AND BAD ACTORS

Medicine is of all arts the most noble; but, owing to the ignorance of those who practice it and of those who inconsiderately form a judgment of them, it is at present far behind all the other arts. Their mistake appears to me to arise principally from this that in the cities there is no punishment connected with the practice of medicine (and with it alone) except disgrace, and that does not hurt those who are familiar with it. Such persons are like the mimes or dummy figures introduced in tragedies, for as they have the shape and dress and personal appearance of an actor, but are not actors, so also physicians are many in title but few in reality.—*The Law*.

³⁶ F. H. Edgeworth: *Bristol Med.-Chir. Jour.*, 1916, xxxiv, 115.

³⁷ Allbutt: *Greek Medicine in Rome*. London, 1921, 180.

DIVINE ORIGIN OF EPILEPSY

And they who first referred this disease to the gods appear to me to have been just such persons as the conjurors, purificators, mountebanks and charlatans now are, who give themselves out for being excessively religious and as knowing more than other people. Such persons, then, using the divinity as a pretext and screen of their own inability to render any assistance, have given out that the disease is sacred, adding suitable reasons for this opinion. . . . But this disease seems to me no more divine than others; but it has its nature such as other diseases have, and a cause whence it originates, and its nature and cause are divine only just as much as all others are, and it is curable no less than the others, unless when, from length of time, it is confirmed and has become stronger than the remedies applied. Its origin is hereditary, like that of other diseases.—*On the Sacred Disease*.

FIGHTING QUALITIES OF FREE AND ENSLAVED PEOPLES

Monarchy prevails in the greater part of Asia, and where men are not their own masters nor independent, but are the slaves of others, it is not a matter of consideration with them how they may acquire military discipline, but how they may dodge the responsibilities of valor; for the dangers are not equally shared, since they must serve as soldiers, perhaps endure fatigue, and die for their masters, far from their wives, children and friends; and whatever noble and manly actions they may perform lead only to the aggrandizement of their masters, whilst the fruits which they reap are dangers and death. . . . Thus, then, if any one be naturally warlike and courageous, his disposition will be changed by the institutions. As a strong proof of all this, such Greeks or Asiatic barbarians as are not under a despotic form of government, but are independent and enjoy the fruits of their own labors, are of all others the most warlike; for these brave danger on their own account, bear the prizes of their own valor, and, in like manner, endure the punishment of their own cowardice.—*Airs, Waters and Places*, 16.

SANITARY SURVEY OF A LOCALITY

When one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun . . . and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky sites, and then if salty and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold; and the way in which the inhabitants live, and what are their pursuits; whether they are fond of eating and drinking to excess, and given to indolence, or are fond of exercise and labor and not given to gluttony and drunkenness. From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing when he comes into a strange city, either the diseases peculiar to the place or the particular nature of common diseases. . . . And, in particular, as the season and the year advances, he can tell what epidemic diseases will attack the city, either in summer or winter.—*Airs, Waters and Places*, 1.

THE PRACTICE OF MEDICINE

The physician must have two special objects in view with regard to diseases viz., to do good or to do no harm. The art consists in three things—the disease, the patient and the physician. The physician is the servant of the art and the patient must combat the disease along with the physician.—*Epidemic Diseases*, I, 5.

SIGNS OF APPROACHING DEATH

The gravest are the following; a sharp nose, hollow eyes, collapsed temples, the ears cold, contracted, with lobes turned out; the skin about the forehead rough, distended and parched; the color of the whole face green, black, livid, or lead-colored. . . . It is a mortal symptom, also, when the lips are relaxed, pendent, cold and blanched. . . . When in acute fevers, pneumonia, phrenitis or headache, the hands are waved before the face, hunting through empty space, as of gathering bits of straw, picking the nap from the coverlid or tearing chaff from the wall—all such symptoms are bad and deadly.—*Prognosis*, 2.

RESPIRATION IN DISEASE

Respiration, when frequent, indicates pain or inflammation in the parts above the diaphragm; a large respiration, performed at wide intervals, announces delirium; but a cold respiration at nose or mouth is a very fatal symptom. Free respiration is to be looked upon as contributing much to the safety of the patient in all acute diseases.—*Prognosis*, 5.

CHEYNE STOKES RESPIRATION IN A FATAL CASE

The breathing throughout, like that of a person recollecting himself, was rare and large.—*Epidemic Diseases*, I, 13.

CLINICAL APHORISMS

- Use the lightest diet at the height of an acute disease.
- Slop diet is suitable in all febrile diseases, particularly in children.
- Labored sleep in any disease is a bad sign.
- Sleep following upon delirium is a good sign.
- Spontaneous lassitude indicates disease.
- Insensibility to great local pain shows that the mind is affected.
- Liquid diet is better for emaciation than solid.
- Never work when hungry.
- Overeating brings on illness, as shown by the treatment.
- Old persons have fewer diseases than the young, but chronic diseases never leave them.
- Very fat persons are apt to die earlier than the slender.
- Sandy sediment in the urine means vesical calculus.
- Blood or pus in the urine points to erosion of the bladder or kidneys.
- Spasm supervening on a wound is fatal.
- Epistaxis in amenorrhœa is good.
- Induration of the liver in jaundice is bad.
- Spinal deformity often coexists with cough and tubercle of the lungs.

Here we have something utterly different from the chaotic rumble bumble of Mesopotamian and Egyptian medicine and something not to be explained by the three thousand years intervening, namely, the free play of a great mind. The Hippocratic descriptions of phthisis, epidemic mumps, epilepsy, the malarial fevers and puerperal convulsions could go without change into any text-book and nothing quite so close to fact was recorded again before the Renaissance, 2,000 years later. Hippocratic surgery is mainly orthopedics and wound surgery. The Hippocratic treatises on fractures, dislocations, head injuries and ulcers

are among the greatest surgical writings of all time. This surgery was, in the main, aseptic, inculcating the use of water as warm as the surgeon's hands could bear, cleansing of the operator's hands, trimming of the nails, dry wound treatment (with avoidance of greasy dressings), rest and immobilization, with a clear notion of healing by first and second intention. The directions for trephining and for setting fractures and dislocations are minute and have been followed for centuries. That the surgery of Hippocrates was mainly derived from and adapted to military conditions is indicated by his own statement in "The Physician;" "Fights between citizens and their enemies are rare, but frequent and almost daily between mercenary soldiers; he who would become a surgeon, therefore, should join an army and follow it." War was the only school for surgery at this time, for the Athenians had already established their great principle that the bearing of arms by civilians is not civilization (Thucydides). "They strove to make gentle the life of the world." With the Spartans, continuous military duty was obligatory between the ages of twenty and sixty, while in the other Greek states, young men were trained for two or three years and released from duty until the hour of need. The Spartans "lived the life of a regiment. Private homes resembled the 'married quarters' of a modern army; the unmarried men lived entirely in barracks. Military exercises were only interrupted by actual service in the field, and the whole life of a man of military age was devoted to them."³⁸ In such a "nation in arms" as Sparta there was some regular medical service, as suggested by the law of Lycurgus that the army surgeons retire to the rear of the right wing during an engagement.

According to Xenophon,³⁹ the surgeons in the Spartan army shared the same tents with the nobles, the soothsayers and the flute-players. In battle, the wounded were rescued by Helots.

The History of Herodotus (484-424 B. C.) is at once an account of his many travels and a general history of Greece, up through the glorious period when the tiny states of Athens and Sparta, relying upon courage and enterprise alone, defeated the gigantic Persian power and saved Europe for a finer civilization. Herodotus and Xenophon are our principal sources for the medical arrangements of the Persian Army, the earliest military organization of magnitude with which recorded history deals. This great army, strong in cavalry, originally made up of Persians alone, was, at the time of the expedition against Greece, augmented by a huge levy of all nationalities. The physicians of the Persian Army and fleet were mercenaries, usually Egyptians or Greeks. One of the latter, Democedes of Croton (520 B. C.), a high-salaried health

³⁸ Capt. C. F. Atkinson: *Encyclop. Britannica*, 11 ed., Cambridge, 1910, ii, 593.

³⁹ Xenophon: *Lacedaemon. Respubl.* iii, 7. Cited by Withington.

officer, being retained at the court of Darius as a captive, actually led an advance guard of Persian spies into Greece in order to get back to his home town (Herodotus, iii, 131-137). Herodotus, a teller of tales, has little to say of organization, but he has many interesting anecdotes, e. g., of the mortality in the Persian army from gluttony and change of water-supply (viii, 117), of their sufferings from epidemic diseases, of a traumatic haemoptysis following a fall from a horse (viii, 88), of various wounds, of the treatment of wounds with dressings of myrrh and flaxen bandages (vii, 181), and of the deaths of Cambyses and Miltiades from traumatic septicæmia or gangrene (iii, 64-66; vi, 134-136).

Xenophon (444-357), a pupil of Socrates (who had saved his life at the battle of Delium), was one of the generals commissioned by the younger Cyrus to raise an army of 10,000 Greek mercenaries ("a marching city state") for his expedition against Artaxerxes. After the defeat and death of Cyrus at Cunaxa (401), Xenophon conducted the retreat of the Ten Thousand Greeks from Babylonia back to their own country. The *Anabasis* is the story of this expedition and retreat (415-400 B. C.). The army consisted of heavy infantrymen (*hoplites*) with bronze shields and helmets, purple tunics, corselets of bone, armed with swords and spears, and light infantrymen (*peltastes*) armed with javelins and wooden shields. Their pay was about \$5.50 monthly, their commissariat meal, mares' milk, and wine, bought of the sutler, with occasional slaughtering and barbecues of animals, when supplies gave out, or in connection with sacrificial rites.

In the whole narrative of the retreat there is only one mention of medical service (iii, 4), although Xenophon himself was sometimes forward with medical aid and advice (v, 8):

Marching thus for the rest of the day, some on the road over the hills, others advancing abreast of them over along the mountains, they came to the villages, and eight surgeons were commandeered, for there were many wounded. Here they remained three days, both on account of the wounded and because they had found, at the same time, abundant supplies, viz., wheat-flour, wine and barley, which had been stored up for horses. These supplies had been collected for the then satrap of the country. But on the fourth day, they went down unto the plain. When, however, Tissaphernes overtook them with his command, necessity taught them to encamp at the nearest village and not to fight while marching; for there were many unfit for action, viz., the wounded, those carrying the wounded and those who bore the arms of such carriers.

In the action preceding this halt, we are told that "the Greeks of their own motion, mutilated the dead, that it might be frightful for the enemy to see" (iii, 4). To lighten the march, the arms were sometimes carried in the wagons, the wounded usually on the backs of comrades, and one bearer was publicly scourged, by order of Xenophon,

for trying to bury a wounded man to get rid of his burden (v, 8). The troops suffered much from cold and frostbite in Armenia, many freezing to death, others laboring under snow-blindness, and Xenophon was extremely solicitous that no one should sink to sleep in the snow and kept his troops in constant motion (iv, 4, 5). Arrow wounds are mentioned, experiences with poisonous honey and headache from date-wine, and it is of record that potable water was boiled by the Persians for Cyrus in silver kettles (Herodotus, I, 188).

Upon returning to Athens, Xenophon found that Socrates had been put to death and his own knightly order in disrepute in the city, whereupon, with the remainder of the Ten Thousand, he joined the forces of Agesilaus, king of Sparta, and after the fashion of disaffected Hellenes, actually fought against his own native city at Coronea (394 B. C.). During the rest of his exile he wrote the *Cyropaedia*, or life of Cyrus, a purposeful glorification of the Persian Empire and army, in aid of his dream of a Confederated Hellas, a project for which Herodotus wrote his history, Isocrates his orations, and Aristotle his Politics. The liberal constitution and government ascribed to an Oriental despotism by Xenophon are purely mythical, and borrowed from the institutions of the Greek city states. In the *Cyropaedia* (i, v, 15-19) Cyrus says to Cambyses, his father, that even as states that wished to be healthy elected a board of health, so he took with him men eminent in the medical profession, as did other generals. In the discussion that follows, one senses the genial superiority of the workings of the Greek mind:

"Yes, my son," said his father in reply to this, "but just as there are menders of torn garments, so also these physicians whom you mention heal us when we fall sick. But your responsibility for health will be a larger one than that; you must see to it that your army does not get sick at all."

"And pray what course shall I take, father," said he, "that I may be able to accomplish that?"

"In the first place, if you are going to stay for some time in the same neighborhood, you must not neglect to find a sanitary location for your camp; and with proper attention you cannot fail in this. For people are continually talking about unhealthful localities and localities that are healthful; and you may find clear witnesses to either in the physique and complexion of the inhabitants; and in the second place, it is not enough to have regard to the localities only, but tell me what means you adopt to keep well yourself."

"In the first place, by Zeus," said Cyrus, "I try never to eat too much, for that is oppressive; and in the second place, I work off by exercise what I have eaten, for by so doing health seems more likely to endure and strength to accrue."

"That, then, my son," said he, "is the way in which you must take care of the rest also."

"Yes, father," said he; "but will the soldiers find leisure for taking physical exercise?"

"Nay, by Zeus," said his father, "they not only can, but they actually must. For if an army is to do its duty, it is absolutely necessary that it never cease to

contrive both evil for the enemy and good for itself. What a burden it is to support even one idle man! It is more burdensome still to support a whole household in idleness; but the worst burden of all is to support an army in idleness. For not only are the mouths in an army very numerous but the supplies they start with are exceedingly limited, and they use up most extravagantly whatever they get, so that an army must never be left idle."

"Methinks, you mean, father," said he, "that just as a lazy farmer is of no account, so also a lazy general is of no account at all."

"But at any rate, as regards the energetic general," said his father, "I can vouch for it that, unless some god do cross him, he will keep his soldiers abundantly supplied with provisions and at the same time in the best physical condition."

In the same work (iii, ii, 12), we are told how Cyrus detailed physicians to treat wounded prisoners:

At this juncture they brought to Cyrus the prisoners in chains and also some that had been wounded. And when he saw them he at once ordered that the fetters be taken off, and he sent for surgeons and bade them attend to the wounded men. And then he told the Chaldeans that he had come with no wish to destroy them and with no desire to make war, but because he wished to make peace between the Armenians and the Chaldeans.

The army of Philip of Macedon, with its famous phalanx, had physicians, one of whom, Critobulus, extracted an arrow from Philip's eye at the siege of Methone. On the expedition of Alexander the Great (336-323 B. C.), physicians were again present, notably Philip, Critobulus and Glaucus. Philip, Alexander's body physician, who was once accused of trying to poison him, cut out an arrow from his shoulder at the siege of Gaza. Glaucus was crucified for failing to heal Haephaestion. There is plenty of evidence of the presence of physicians at battles in Greek history. An inscription of 450 B. C. at Dali in Cyprus records a decree of the Demos that the physician Onasilos and his pupils be rewarded for attending the wounded in the Idalian expedition against the Persians. That the physician Ctesias healed the wound of Artaxerxes at Cunaxa is recorded in the *Anabasis* (i, 8). Epaminondas, creator of the Theban phalanx and of the swift oblique movements adopted by Frederick the Great, was mortally wounded at Mantinea (362 B. C.), his death resulting from the withdrawal of a spear from the wound by his physician. Finally, at the defeat of the Spartans at Sellasia (222 B. C.), the Greek's last stand for freedom, every house opened its doors and all Lacædemonians united in refreshing the soldiers and in binding up their wounds, a trait more characteristic of republican Rome than of Greece.⁴⁰

Much was done for the health and stamina of soldiery by the splendid system of physical training and cult-cleanliness of the Greeks, their gymnastics and bathing habits, which have become the ideal of our own

⁴⁰ E. T. Withington: *Medical History*. London, 1894, 74.

time, both in military and civil hygiene. A Greek vase in the Louvre shows a youth preparing to wash his feet, with the inscription ἔρχεται, "he makes himself ready for marching."⁴¹ That shower baths of recent type were common is also evident from these antique vases.⁴²

Of the total achievement of the Greeks in personal and public hygiene, in the light of recent researches, of what they did for physical training and military morale, Sudhoff has written with force and precision:⁴³

Viewed in the light of hygiene alone, classical antiquity, Greece and Rome, represent a cultural pinnacle of almost incomparable height.

The Greeks, a master people (with a substratum of slaves), for the first time in history, and in a scope and degree never again approached, undertook universal training of boys (in some phratries, of girls, also), with a view to the harmonious development of all the physical faculties and to the attainment of the greatest measure of strength, dexterity and self-confidence, of physical perfection and beauty. The system was founded upon daily exercise from earliest youth to ripe manhood, under the supervision of experienced and practised leaders, who not only strove to make it viable and successful, but were capable of intelligent specialization, exacting from each physical entity the highest possible accomplishment, with constant reference to general vigor. The teacher of gymnastics became the professional "gymnast," who strove to comprehend the normal functions of the body, vying with the medical fraternity, who again studied the value of gymnastics for a healthy physique and took from its storehouse of anatomic-physiologic knowledge the plumb line for estimating the possibilities of each individual. With the aid of general dietetics, the physicians deduced the norms for the application of gymnastics to the prevention of bodily ills and as an auxiliary in the treatment of general or organic disorders. Under this beneficent rivalry between professional gymnast and physician, gymnastics itself became a scientific system of physical exercise and invigoration, of hygiene of movement and occupation, such as we today, with the aid of modern technique and instrumental precision, are intent upon creating anew.

With this central endeavor of Hellenism (physical invigoration by daily gymnastic exercise), the rest of personal hygiene was in great measure associated, viz., care of the skin by washing and bathing, by swimming and massage; physical cleanliness, including care of the hair and clothing; as well as regulation of diet, rest and sleep, and of the sexual life. The regulation of the latter function in the gymnastic exercises of girls was divorced from prudery and had a definite eugenic aim: vigorous offspring.

The public officers of Greece were engrossed with other questions of hygienic importance. Town planning, arrangement of streets, sunning of houses, sewage disposal and water supply were carefully considered and purposefully regulated, especially in the culminating cultural period of the Age of Tyrants. The Romans, among whom solicitude for the purity of grain and potable water was recognized almost as a religious and state duty, with their eminent talent for solving great problems, contributed much to public hygiene. In the days of their world empire, water supply, drainage, road-building, town-planning, food-control, heating, and baths were regulated with a thoroughness which evokes our respectful admiration

⁴¹ Sudhoff: *Aus dem antiken Badewesen*. Berl., 1910, 17-18.

⁴² Sudhoff: *op. cit.*, 59-62 (illustrations).

⁴³ Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 112-113.

even today. In the cult of Vesta and Juturna, the Roman early evinced an inherent sense of the fundamental necessity for purity of food, which can proudly take its place beside the justly extolled cult of food-hygiene of the Orient. . . . For Graeco-Roman antiquity, we must again repeat that, although hygienic requirements were partly based on cult-hygiene, these peoples soon outgrew this purposeless infancy and set themselves conscious hygienic goals, devoted themselves to their attainment in a large genial manner, and accomplished results which, in addition to constituting a scientific supervision of the life of the individual, will forever merit admiration as the first attempt (conceived and executed with genius) at personal and public hygiene with definite aims: indirect prophylaxis by increasing the vigor and resistance of two whole nations.

CHAPTER III

Rome

(Republic and Empire)

In a delightful little book, issued by the London Society for Promoting Christian Knowledge,¹ Flinders Petrie cautions historical students against our common human tendency to condemn or cry down a given thing because Nature made it what it is and not something else:

When we try to estimate the condition of historic periods we must not lay too much stress on unaccustomed features. The Egyptian kings of the XVIIIth dynasty have been absurdly compared to Mtesa, because they maltreated their enemies. Rather we should class them above Louis XIVth, who infamously tortured his most faithful subjects if they differed from him in religion. We must avoid trusting our judgment too exclusively either on moral or on artistic grounds—both have their place in judging of a civilisation. We must not refuse our admiration for the “best and greatest” of Emperors, Trajan, because his life was such that he would be sent to penal servitude in these days. . . . Similarly, on the other hand, we must not depreciate the moral grandeur of Isaiah or Amos because the sculpture of that age is trivial and its pottery ugly. Nor must we depreciate Greek art and philosophy because their politics were shortsighted and amenable to Persian gold. Each civilisation has to be adapted to its own conditions, and by its success in those conditions, and the benefits it has bequeathed to mankind, it must be judged by posterity.

In considering the Romans, an essentially military nation, one should endeavor to see this great people also “with the equal eye of Nature.” The systematic depreciation of Caesar, Augustus and the better sort of emperors, by Wells (as socialistic propaganda), may be taken *cum grano salis*, like the laborious whitewashing of Henry VIII by Froude (for theological reasons), or of Tiberius Caesar by Ferrero (for reasons known only to himself). There are two great social forces which have been in continual conflict since the Roman period, one defined by Roosevelt as “centrifugal,” as seeking individual freedom and independence at the expense of stable, centralized government; the other “centripetal,” seeking a rigid, stable social order at the expense of

¹W. M. Flinders Petrie: *Some Sources of Human History*. London, 1919, 22.

personal liberty.² The logical term and end of the one is anarchy; of the other, tyranny. In adjusting the merits of either, the exquisite judgment of Theodor Mommsen remains unassailable for equity and fairness, even though his argument now reads like a veiled defense of Prussian policy:

It is only a pitiful narrow-mindedness that will object to the Athenian that he did not know how to mould his state like the Fabii and the Valerii, or to the Roman that he did not learn to carve like Phidias and to write like Aristophanes. It was in fact the most peculiar and the best feature in the character of the Greek people that rendered it impossible for them to advance from national to political unity without at the same time exchanging their polity for despotism. The ideal world of beauty was all in all to the Greeks, and compensated them to some extent for what they wanted in reality. Wherever in Hellas a tendency towards national union appeared, it was based not on elements directly political, but on games and art: the contests at Olympia, the poems of Homer, the tragedies of Euripides, were the only bonds that held Hellas together. Resolutely, on the other hand, the Italian surrendered all arbitrary aspiration toward freedom, and learned to obey his father that he might know how to obey the state. Amidst this subjection individual development might be marred, and the germs of fairest promise in man might be arrested in the bud; the Italian gained in their stead a feeling of fatherland and of patriotism such as the Greek never knew, and alone among all the civilized nations of antiquity succeeded in working out national unity in connection with a constitution based on self-government—a national unity, which at last placed in his hands the mastery not only over the divided Hellenic stock, but over the whole known world.³

The Romans, compounded of an ascendant Northern strain (Umbrian and Sabine), an Oriental strain (Etruscan), an autochthonous, neolithic strain (Ligurian), and (in Southern Italy) of an independent group of Hellenic colonials (Magna Graecia), were more diverse and stranger in their ethnic plies than the Greeks; but the “close-fisted Umbrian,” the “sombre Puritanical Sabine” and the “obese Etruscan” were all of a piece in warlike disposition, in hard and exclusive caste feeling, in dogged, obstinate perseverance, in rustic austerity of demeanor and morals and “by their fusion Rome was created” (Allbutt)⁴ The dominating Latin stock was thus rustic, tight fisted, hard bargaining, like all tillers

² “Why do great artificial empires, whose citizens are knit by a common bond of speech and culture much more than by a bond of blood, show periods of extraordinary growth, and again of sudden or lingering decay? In some cases we can answer readily enough; in other cases we cannot as yet even guess what the proper answer should be. If in any such case the centrifugal forces overcome the centripetal, the nation will of course fly to pieces.” Theodore Roosevelt: *Biological Analogies in History*, New York, Oxford Univ. Press, 1910, 23.

³ Mommsen: *History of Rome*, N. Y., 1870, I, 55.

⁴ Allbutt (*Greek Medicine in Rome*, 14) notes the shrewd differentiation of these ethnic strains by the poet Catullus (88–58 B.C.): “Si urbanus esses aut Sabinus aut Tiburs
Aut parvus Umber aut obesus Etruscus
Aut Lanuvinus ater atque dentatus, etc. (XXXIX, 10–12) and elsewhere the “tetrica et tristis Sabinorum disciplina.”

of the soil⁵, "more superstitious than religious," yet canny rather than narrow-minded, with little or no artistic feeling, and no medicine except folk- or domestic medicine. The slow climb to the highly artificial civilization of the Empire (with its wonderfully organized army and medical corps as the backbone of the state) was a long process of trial and error, "always more remarkable," as Mommsen says, "for tenacity, cunning and consistency than for grandeur of conception or power of rapid organization." Time and again the Romans failed in battle, as in the egregious blunders of the Punic Wars, but in the end the very name "Roman" came to imply rugged fortitude and contempt for disaster, invincible morale, dogged tenacity of purpose and unbeatable persistency of effort. "The Hellenes," says Mommsen, "sacrificed the whole to its individual elements, the nation to the township, and the township to the citizen." The Romans, on the other hand, "bade the son to reverence the father, the citizen to reverence the ruler, and all to reverence the gods; required nothing and honored nothing but the useful action; compelled every citizen to fill up every moment of his brief life with incessant work; condemned every citizen who wished to be different from his fellows; regarded the state as all in all and a desire for the state's extension as the only aspiration not liable to censure" (II, 48). The Roman gods, were not, as with the Greeks,

"The intelligible forms of ancient poets,
The fair humanities of old religion,"⁶

but metaphysical abstractions applied to every object or event in life (plowing, child-birth, scabies, malarial fever, etc.). The Roman conception of religion (*religio*), was, as with the Hebrews, "that which binds." In Allbutt's view, "Rome starved individual religion by identifying it with the state and by using it as a buttress to the imperial power."⁷

In the citizen army of republican Rome there were no medical arrangements for the care of the sick and wounded beyond the ordinary wound-dressing we have seen in the Iliad. Early Rome was mainly an agricultural community, with no provisions for medicine, beyond such skill in domestic and veterinary medicine as every citizen, as house-father, was expected to have and to practise. In the days of the Empire, Greek medicine had become firmly established in Rome, and the imperial armies acquired a well-organized medical establishment, the first and the best in antiquity.

⁵ Some of the bravest and ablest of the earlier Roman commanders, e.g., Marcus Furius Camillus, Marcus Curius Dentatus and L. Quintius Cincinnatus, went straight from the plow to the field of battle.

⁶ Schiller: Wallenstein (Coleridge's translation).

⁷ Sir T. C. Allbutt: Greek Medicine in Rome, London, 1921, 21.

*Organization of the Roman Army under the Republic*⁸

The Roman Army began with the foundation of Rome (753 B.C.) and for centuries was made up of organized militia, i.e., of levies of citizens. The army of Romulus consisted of 300 light cavalrymen (*celeres*) and 3,000 infantry (*milites*), to which each of the three tribes contributed a third, commanded by their own tribunes. These soldiers provided their own arms and armour, served without pay as a patriotic privilege, and were drawn mainly from the better classes of society. Under the king Servius Tullius (578-534 B.C.), the so-called Servian constitution went into effect, reorganizing the whole fabric of Roman society along military lines. Every householder, even the manumitted slave who held property, was made liable to military service between the ages of 17 and 60, with the sensible regulation that those between 17 and 46 served in the field, those between 47 and 60 within the walls of the city. The *centuriae* of cavalry were increased six-fold (1,800); each legion of infantry now consisted of 4,200 men, of whom 3,000 were the original heavy infantry (*hoplites*) of Romulus, and 1,200 light infantry (*velites*), who, in later times, were usually commandeered to evacuate the wounded after battles. The selection of this army was apportioned among four districts of the state, according to the findings of the census, which was instituted by Servius for the sole purpose of ascertaining the military man-power of Rome.

During the early period when the Romans, beleaguered by enemies, had to fight for their very existence, the battle organization was the old Grecian phalanx, a solid front of 500 men, six files deep. The troops in the rear files were protected by man-sized shields (*clypei*), which proved very useful in covering or bearing wounded comrades. As the Roman nation advanced from a policy of self-defence and self-determination to the necessary assimilation of the whole peninsula of Italy, an army of conquest was developed, the main advantages of which were a system of pay and long service, so that even the poorer classes who owned no property (*capite censi*) were privileged to serve. These changes were instituted about the time of the siege of Veii (396 B.C.) and are attributed to Marcus Furius Camillus. Camillus substituted for the old phalanx formation a three-line arrangement by maniples, a flexible chess-board formation in open order (3 x 10), which threw the responsibilities of initiative upon each isolated unit and each individual man. In this arrangement, the front row (*hastati*) bore the brunt of battle, the second row (*principes*) passing through the intervals and taking the front line if the *hastati* gave out, while the third row (*triarii*) remained kneeling behind their shields, closing up the intervals and participating in a general assault only when the whole line wavered. It was through this battle formation that Roman valor won its distinctive laurels in the days of the Republic. The main defect of the Roman Army in this early period was that appointments to commands were temporary and political. As every Roman citizen had military training, the two consuls became *ex officio* commanders-in-chief of the army, with the result that no individual military policy could be permanent. Commands as well as commanders were influenced by the programs of political parties and the vacillation, hesitation, and dread of responsibility, which go along with temporary or precarious tenure of office, were everywhere apparent.⁹

⁸The best and most thoroughgoing account of the administration of the Roman Army, including its medical arrangements under the Empire, is that of Joachim Marquardt in Marquardt & Mommsen: *Handbuch der römischen Alterthümer*, 2. Aufl. Leipzig, 1884, v (Römische Staatsverwaltung, II, pt. 3, Das Militärwesen), 317-612.

⁹See Capt. C. F. Atkinson: *Encyclop. Britan.*, Cambridge, 1910, II, 595. Mommsen discusses this matter in his *History*, particularly in his account of the masterly inactivities ("Fabian policy") of Quintus Fabius Maximus (II, 148-153).

Status of Military Medicine under the Roman Republic

Before the ascendancy of Julius Caesar (54–44 B.C.), who gave to physicians the right of citizenship, medicine, as practiced by the Greeks, was despised in Rome, and military medicine was non-existent. Greek physicians were scorned, as taking fees, and feared, as possible poisoners. Roman medicine was domestic and herbal medicine, with knowledge of a few hæmostatic remedies¹⁰ and the usual accompaniment of superstitious observances related to the household gods. Cato the Censor boasted that ancient Rome was “without physicians, but not without medicine” (*sine medicis sed non sine medicina*) and treated every ailment, even wounds, with the cabbage. Pliny the Elder (23–79 A.D.), in the days of the Empire, voices the ancient clan-prejudice against the ways of the foreigner:

For some trifling sore or other, a medicament is prescribed from the shores of the Red Sea; while not a day passes but what the real remedies are to be found upon the tables of the very poorest among us. But if the remedies for diseases were derived from our own gardens, if the plants or shrubs were employed which grow there, there would be no art, forsooth, which would rank lower than that of medicine. Yes, avow it we must—the Roman people, in extending its empire, has lost sight of the ancient manners, and we the conquerors are conquered; for now we obey the natives of foreign lands, who by the agency of a single art have outgeneralled our generals. (Natural History, XXIV, 1.)

When wounded, the Roman soldier, in this early period, was bandaged either by himself or by his comrades, presumably with materials carried about his person. That the art of bandaging was as well known to the early Romans as to the ancient Egyptians is apparent from Livy's account of the assassination of Tarquin (616 B.C.), when Tanaquil, his wife, “sedulously prepares everything necessary for dressing the wound” and later assures the people that “the wound had been examined, the blood wiped off, that all the symptoms were favorable.”¹¹ An instance of many soldiers bandaging themselves and feigning wounds to avoid service under an unpopular leader, Appius Claudius (469 B.C.) is on record.¹² The pathetic image of the Dying Gaul (Capitoline Museum, Rome) suggests, however, the fate of the luckless, whether Roman or barbarian. If abandoned or left in the lurch, the wounded soldier could do little but crawl to shelter and die. But the Romans of the Republic had a kind of family interest in their citizen army, recruited from the people without pay, and stood by it in the hour of need. Thus, Tacitus, in describing the caving in of the amphitheater of Fidenæ in the reign of

¹⁰ Medicina quondam fuit paucarum scientia herbarum, quibus sisteretur fluens sanguis, vulnera rent. Seneca: Ad Lucilium, lib. XV, 8, ep. 3, 95. Cited by Haberling.

¹¹ Inspectum vulnus absterso cruore, omnia salubria esse. Livy I, 41.

¹² Dionysius Halicarnassensis: Antiquitates Romanorum, IX, 50.

Tiberius (27 A.D.), refers to the solicitude of the populace for the 50,000 killed and injured, as follows:

The city of Rome recalled in that time of mourning an image of ancient manners, when after a battle bravely fought, the sick and wounded were received with open arms and relieved by the generosity of their country.¹³

In the Roman History of Livy, which shadows forth the underlying principles of administration for evacuation of the wounded, as we now know it, one can trace, chapter by chapter, the gradual evolution of the two fundamental concepts, viz.: (1) care of the wounded as a military necessity and patriotic duty; (2) demoralization of the fighting line by the misery of the wounded, when the primal duty of evacuation is neglected.

Thus, as early as 502 B.C., we find that it was customary for the Roman armies to take their wounded with them after a battle, to remain with them until they were in condition to be moved or to leave them in a safe place:

502 B.C. (A.U.C. 252). "The consul was left among many more who were wounded, with very uncertain hopes of his recovery. After a short time, sufficient for curing their wounds and recruiting their army, they marched against Pometia with redoubled fury and augmented strength." (II, 17).

"421 B.C. (Volscian Wars): "Taking with him all the wounded he could, and not knowing what route the consul had taken, he (Tempanius) proceeds by the shortest roads to the city" (IV, 39).

Later on, billeting or cantonment hospitalization was common:

212 B.C. "But none of the enemy coming out against them, they gathered the spoils at their leisure and collecting the bodies of their own troops into a heap, burnt them. . . . As soon as daylight discovered the flight of the enemy, Marcellus, leaving his wounded under the protection of a small garrison at Numistro, in command of which he placed Lucius Furius Purpureo, a military tribune, commenced a close pursuit of Hannibal and overtook him at Venusia" (XXXVII, 33).

203 B.C. "The wounded were then conveyed into the town of Æbura, and the legions marched through Carpetania, against Contrebia" (XL, 33).

In 478 B.C., we find Fabius Maximus leaving his wounded in the houses of patricians, particularly of his own family:

478 B.C. "And not unmindful of that which he had conceived at the beginning of his consulate, namely the regaining of the affection of the people, he distributed the wounded soldiers among the patricians to be cured. Most of them were given to the Fabii; nor were they treated with greater attention in any other place. From this time on the Fabii began to be popular, and that not by any practices except such as were beneficial to the state" (II, 47).

Desertion of the wounded in a tight place was more common among the Volscians and Carthaginians than the Romans:

421 B.C. (Volscian Wars): "Such a panic seized both camps, from their un-

¹³ "Fuitque urbs per illos dies, quamquam maesta facie, veterum instituti similis, qui magna post proelia saucios largitione et cura sustentabant." Tacitus, *Annales*, IV, 63.

certainty as to the issue, that, leaving behind their wounded and a great part of their baggage, both armies, as if vanquished, betook themselves to the adjoining mountains" (IV, 39).

341 B.C. (Conflict with the Hernicians): "Many fall on both sides; more are wounded. . . . Next day the camp of the Hernicians was deserted, and some wounded men were found left behind" (VII, 8).

340 B.C. "The Volscians, reckoning up what men they had lost in battle, had by no means the same spirit to repeat the risk. They went off in the night to Antium as a vanquished army in the utmost confusion, leaving behind their wounded and part of their baggage" (VIII, 1).

As late as 210 B.C. we find Marcellus unable to follow up his victory over Hannibal on account of solicitude for his wounded:

210 B. C. "The following night, Hannibal decamped. The great number of the wounded prevented Marcellus from following him as he desired" (XXVII, 2).

Early in the Samnite Wars it had been found that the presence of the wounded at the front after a battle had a deplorable effect upon the morale of the command:

295 B.C.: "They all assured him that they would do everything in their power, but that the soldiers were quite dejected; that, from their own wounds, and the groans of the dying, they had passed the whole night without sleep; that if the enemy had approached the camp before day, so great were the fears of the troops, they would certainly have deserted their standards" (X, 35).

The bad effect of epidemic disease upon morale is emphasized in the account of the siege of Syracuse, and it is of interest to note here that the sick were attended and cared for, perhaps by comrades, if not by women:

212 B.C.: "They were visited too by a plague; a calamity extending to both sides, and one which might well divert their attention from schemes of war. . . . The intolerable intensity of the heat had an effect upon the constitution of almost every man in both camps. At first they sickened and died from the unhealthiness of the season and the climate; but afterwards the disease was spread by merely attending upon and coming in contact with those affected¹⁴; so that those who were seized with it either perished, neglected and deserted, or else drew with them those who sat by them and nursed them, by infecting them with the same violence of disease.¹⁵ Daily funerals and deaths were before the eye, and lamentations were heard from all sides, day and night. At last their feelings had become so completely brutalized by being habituated to these miseries, that they not only did not follow their dead with tears and decent lamentations but they did not even carry them out and bury them; so that the bodies of the dead lay strewn about, exposed to the view of those who were awaiting a similar fate; and thus the dead were the means of destroying the sick, and the sick those who were in health, both by fear and by the filthy state and the noisome stench of their bodies. Some, preferring to die by the sword, even rushed alone upon the outposts of the enemy" (XXV, 26).

¹⁴ "Curatio ipsa et contactus aegrorum vulgabat morbos."

¹⁵ "Aut assidentes curantesque eadem vi morbi repletos secum traheret." This is exceedingly interesting as showing that Livy (59 B.C.-17 A.D.) had, in his time, some notion of contagion, to which the Greeks were blind. Virgil, living in the same period, is aware of the possibility of contagion among cattle: "Nec mala vicini pecoris contagia laedent." Eclogue, I, 51.

It was sometimes dangerous for a Roman commander to neglect his wounded; his soldiers would not fight for him if he did:

323 B.C.: "The experienced commander quickly perceived the circumstances which prevented his success, and that it would be necessary to moderate his temper, and to mingle mildness with austerity. Accordingly, attended by the lieutenants-general, going around to the wounded soldiers, thrusting his head into their tents, and asking them, one by one, how they were in health; then mentioning them by name, he gave them in charge to the officers, tribunes and prefects. This behavior, popular in itself, he maintained with such dexterity that by his attention to their recovery he gradually gained their affection; nor did anything so much contribute to their recovery as the circumstances of this attention being received with gratitude. The army being restored to health, he came to an engagement with the enemy, and both himself and the troops being possessed with full confidence of success, he so entirely defeated and dispersed the Samnites that that was the last day they met the dictator in the field" (VIII, 36).

At the battle of Nadogare (204 B.C.), the Carthaginians even drove away their panic-stricken and wounded in order not to demoralize that part of their fighting line which was holding its ground:

204 B.C.: "Not even then, however, did they receive unto their line the terrified and exasperated troops, but closing their ranks, drove them out of the scene of action to the wings and the surrounding plain, lest they should mingle these soldiers, terrified with defeat and wounds, with that part of their line which was firm and fresh" (XXX, 34).

In the same battle, Scipio Africanus had already some arrangement for evacuating his wounded to the rear during the engagement:

204 B.C.: "Scipio, perceiving this, promptly ordered the signal to be given for the spearmen to retreat, and having taken his wounded to the rear (*postremam in aciem*) brought the *principes* and *triarii* to the wings, that the line of spearmen in the center might be more strong and secure" (XXX, 34).

That more died from battle wounds than were killed did not escape the attention of the historian:

310 B.C.: "And among the Romans, so numerous were the wounds that more wounded men died after the battle than had fallen on the field" (IX, 32).¹⁶

Observations of this kind, in which Livy is more profuse than any other historian, undoubtedly had their weight in bringing to pass an organized medical service for the Roman Army, mainly on account of the effect of such losses upon military operations.

The argument of one of the lost books of Livy (Book LVII) records the terrible *dressage* initiated by Scipio Africanus as a measure against prostitution in cantonment areas; but it is not known whether this lost

¹⁶ "Et apud Romanos tantum vulnere fuit, ut plures post proelium paucii decesserint, quam ceciderant in acie" Livy, IX, 32.

book contained any reference to venereal disease, over and above the obscure allusions in Martial and Juvenal:

Scipio Africanus laid siege to Numantia (B.C. 133), and restored to the strictest military discipline the army, which had been corrupted by licentiousness and luxury; this he effected by cutting off every kind of pleasurable gratification; driving away the prostitutes who followed the camp, to the number of two thousand; keeping the soldiers to hard labor, and compelling every man to bear on his shoulders provisions for thirty days, besides seven stakes for their fortifications. To any one who lagged behind on account of the burden, he used to cry out: "When you are able to defend yourself with your sword, then cease to carry your fortification"; he ordered another who carried with ease a small shield, to bear one unusually large; and not infrequently ridiculed them for being more expert in managing their shields for the defence of their own bodies than their swords for the annoyance of those of the enemy. When he found any man absent from his post, he ordered him to be flogged with vine twigs, if a Roman; if a foreigner, with rods. He sold all the beasts of burden, that the soldiers might be forced to carry their own baggage. He engaged in frequent skirmishes with the enemy, with good success.

That Roman barracks were still huts of the Homeric type, even during the second Punic War, is also recorded by Livy:

212 B.C.: "He had compelled his soldiers, withdrawn from the houses, to build themselves huts after the military manner, near the gates and walls; at once, that the houses of the city might be let and occupied with the land, and also through fear, lest the excessive luxury of the city should enervate his troops as it had those of Hannibal. Now most of these were formed of hurdles and boards, others of reeds interwoven, all being covered with straw" (XXVII, 3).

In the Etruscan Wars, winter huts were a novelty:

402 B.C. (War with Veii): "When the Roman generals conceived greater hopes from a blockade than from an assault, winter huts also, a thing quite new to the Roman soldier, began to be built. . . . They were harassed and worked much more severely than those of Veii. For the latter spent the winter beneath their own roofs, defending their city by strong walls and its natural situation, whilst the Roman soldier, in the midst of toil and hardship, continued beneath the covering of skins, overwhelmed with snow and frost, not laying aside his arms even during the period of winter, which is a respite from all wars by land and sea" (V. 2).

The following passages in Livy are of particular importance as showing that the bandaging of wounds, by soldiery themselves, was a commonplace procedure in the earlier Roman armies:

448 B.C.: "While stripping the body of his enemy, he (Herminius) himself received a wound with a javelin; and though brought back to the camp victorious, yet he died during the first dressing of it" (II, 20).

351 B.C.: "The consul (Marcus Popillius Laenas), having his left arm well-nigh transfixed with a javelin, while he exposed himself incautiously in the van, had retired for a short while from the field, and now, by the delay, the victory was on the point of being relinquished, when the consul, having had his wound tied up, riding back to the van, cries out, 'Soldiers, why do you stand,' etc." (VII, 24).

That Roman commanders themselves were sometimes expert in

wound treatment, and attended their own men, is recorded by both Dionysius and Polybius:

“When the consul Æmilius, after the defeat of the Volscians, had set up a camp at Longula, he remained there and restored the wounded with remedies” (Dionysius, VIII, 35).

Publius Cornelius Scipio, severely wounded in the battle of the Trebia (220 B.C.), “occupied himself with the treatment of his own wounds and those of his comrades” (Polybius, III, 66, §9).

As we approach the period of Julius Caesar, evidences of the existence of wound surgeons (*medici vulnerarii*) in the Roman army become more definite. Archagathus, the first Greek physician to settle in Rome (219 B.C.), was called by the people *vulnerarius*, on account of his surgical skill, and *carnifex* (executioner) on account of his lethal operations. He was forced to leave the city. Cicero, in his second Tusculan Disputation (*circa* 70 B.C.), says:

If we notice how the wounded, borne in from the line of battle, behave themselves, it will not escape our observation that raw recruits make shameful outcries over slight wounds, while the experienced, seasoned soldier is pluckier and merely looks around for a surgeon to apply the dressing.¹⁷

Virgil (70–20 B.C.) introduces the aged wound-surgeon, Iapyx, and the physician-priest, Umbro, as stock figures in the *Æneid* (VII, 756; XII, 396), with accounts of wound-treatment (XII, 387; 400; 411). Caesar himself, distributed his wounded in places occupied by Romans,¹⁸ and his subaltern field-commander, Labienus, had advanced far enough in methods of evacuation to send his wounded to Adrummentum in wagons for treatment (46 B.C.).¹⁹

But the great improvements that were to come in Roman medico-military administration were bound up with the advancement of medicine in Rome by Greek physicians.

Greek Medicine in Rome

The story of the introduction of Greek medicine into Rome has recently been told with unapproachable skill and charm by Sir Clifford Allbutt, to whose pages the reader may be referred for the extraordinary array of minutiae which have accumulated about this phase of history, through the labors of medical philologists. The matter was of greatest moment for the future medical administration of the Roman army as it meant the gradual breaking down of the ancient Latin prejudice against medical science, the actual residence in Rome of the greatest physicians

¹⁷ “Quin etiam videmus ex acie efferri saepe saucios, et quidem rudem illum et inexercitatum quam vis levi ictu ploratus turpissimos edere; at vero ille exercitatus ob eam rem fortior, medicum modo requirens, a quo obligetur. Cicero: Disp. Tusc. iv, 16, 38.

¹⁸ Caesar: De bello civili III, 75; 78, 2.

¹⁹ “Saucios in plaustis deligatos jubet Adrummentum deportari.” Caesar: De bello Africano, 21.

of the period, and the eventual participation of Roman citizens themselves in the civil and military practice of medicine.

The prejudice of the Roman citizen against Greek physicians was due to the fact that the first to come into the city were slaves (*servi medici*), who were sometimes employed to poison enemies by their masters. Archagathus, the first Greek physician to settle in Rome (220 B.C.), was, however, accepted as a Roman citizen and had an office (*taberna*) near the Forum Marcelli.

Greek medicine acquired consideration and esteem through the superior abilities of Asclepiades of Prusa (Bithynia), who settled in Rome in 91 B.C. and lived to an extreme old age.

Extolled by Celsus and Scribonius Largus, reviled by Pliny and Galen because of his Alexandrian training, Asclepiades had many of the traits of the "society physician." His observation that Nature is as likely to kill the patient as to cure him was reiterated by Sir William Gull in a conversation with Huxley. A master of rhetoric and sophistry, Asclepiades was alive with the discriminating intelligence of the Greek. He inculcated the atomic theory of Democritus, held that the "soul" is not an entity but the sum of the functions of the body, experimented with decerebrated animals, differentiated mental disorders from the cerebral manifestations of disease other than those of the brain, and won over the Romans by his mild and rational system of physiological therapeutics (diet, baths, gymnastics, massage, etc.). His voluminous writings have been lost and he exists for us only in a few fragments and stray references.

Celsus, who flourished in the reign of Tiberius Caesar (14–37 A.D.), was inferentially a Roman citizen, who compiled the most valuable encyclopædia of medicine and surgery in antiquity. This work, mainly derived from Greek sources, shows the notable advances made in the practice of medicine during the five centuries between Hippocrates and the Christian era. The degree of specialization attained is fairly indicated in the titles of some of the chapters, e.g., on diseases of the colon, on the varieties of phthisis, on diseases of the stomach, liver, spleen, kidneys; on diseases of the skin, ears, eyes, nose, mouth, tonsils; on wounds of the intestines, on hernia, varix, varicocele, gangrene, etc. The chapter on military surgery is entitled "On the extraction of weapons from the body,"²⁰ and is of particular interest as showing that stones and leaden bullets, discharged by the Balearic slingmen or the ballistic apparatus, were sometimes lodged in the body, even before the days of firearms:

"When foreign substances, such as weapons, have penetrated the body, their extraction is frequently attended with great trouble. There is some difficulty arising from the different kinds of them, and sometimes from the nature of the parts they have penetrated. Now every weapon is extracted, either in the direction by which it entered, or in the point to which it tends; in the first case it returns by the same passage itself has made; in the latter it must receive its exit from the scalpel. For

²⁰Celsus: *De re medica*, vii, 5. Transl. by Alex. Lee, London, 1831, 234–239.

the flesh must be incised over the weapon's point. But if the weapon have not pierced far, and is only under the surface of the flesh, or at least have not passed through large veins and nervous parts, the best plan is to remove it by the way it entered.

But if the space through which the weapon has to return be more than that which is to be laid open, and it has already passed through veins and nerves, it will be more advisable to open what remains, and to extract it in that direction; for it will be found nearer, and drawn out with greater safety; and when the weapon has passed beyond the middle of one of the larger limbs, it will heal the sooner for being pervious, as the wound may be dressed at both extremities.

But if the weapon is to be withdrawn by the same way it entered, the wound must be enlarged by the scalpel, in order that it may pass the more easily, and produce less inflammation, which will be greater if the flesh be lacerated in withdrawing the weapon. Again, if a counter-opening is to be made in any part, it ought to be so large, that the weapon may not increase it in transit. In either case, the utmost care should be employed, lest a tendon, or large vein, or artery be divided.

When any of these are exposed, it must be seized by the blunt hook, and held aside from the knife. But when the incision has been made sufficiently large, then the weapon must be taken out by the same means, and the same circumspection is to be used, lest any of those parts which I have already mentioned be injured whilst the weapon is being taken out.

The preceding observations are general; but there are certain peculiarities in the several kinds of weapons which I shall subjoin immediately. Nothing penetrates the body with greater facility than an arrow; and it also lodges at the greatest depth. Now this happens, both because it is propelled with great force, and because it is in itself of a narrow slender form. Therefore it must be withdrawn more frequently from the opposite part, than from the one on which it entered; and that especially since it is mostly surrounded with barbs, which lacerate more by a retrograde motion, than when extracted in the opposite direction. A counter-opening being made, the flesh ought to be drawn apart by an iron instrument made in the form of the Greek letter Λ : then, when the point has appeared, if the shaft adhere, it must be propelled forward until it can be seized on the opposite side and extracted; but if the shaft have been detached, and only the iron head remain within, the part must be grasped either by the fingers or by the forceps, and so drawn out.

Neither is there any other method of extracting it, when it is considered advisable to remove it by the orifice it came. For the wound being enlarged, either the shaft, if there, is to be extracted, or, if not there, the iron head itself. But if the barbs are discovered, and they appear to be short and small, they ought to be broken there by the forceps, and the weapon freed from these to be drawn out: but if these barbs be large and very strong, they are to be covered by split writing-reeds, and so extracted, lest they should lacerate any part. These observations are to be followed in extracting arrows.

But if a broad weapon were lodged in the body, it is improper to dislodge it by a counter-opening, lest we add another large wound to the one already made by the weapon itself. Therefore it is to be extracted by a certain kind of iron instrument which the Greeks denominate the *graphiskos* of Diocles, because Diocles was the inventor of it, whom I have already noticed as the greatest among the ancient physicians. Namely, a plate of iron, or even of brass, at one end having two hooks turned downwards on each side: the other end is folded or turned up on each side, and the extremity slightly curved towards that part which is bent, and it is also

perforated there. This is introduced transversely near the weapon; and then, when it has reached the farthest point of it, it is to be turned a little, so that it may receive the weapon in its opening. When the point is in the perforation, two fingers are to be applied to the hooks at the other end, when the instrument and weapon are to be extracted at the same time.

The third kind of missile which ought to be extracted sometimes is a leaden bullet, or stone, or something similar, which having perforated the skin, becomes entirely concealed there. In all such cases, the wound must be enlarged, and the foreign body must be withdrawn with the forceps by the way it entered.

The operation is more difficult in every wound, if the foreign body is either fixed in a bone, or has plunged itself in a joint between two bones. In the bone, the weapon must be moved to and fro till it becomes detached where it was grasped at the point; and then the weapon may be extracted either with the hand or forceps, as in drawing a tooth. By this method, it scarcely ever happens that the weapon is not brought away: but if it still remains, it may be dislodged by striking it with some iron instrument. The last resource, when we have failed to remove it, is to perforate the bone near the part with a trephine, and from that opening to excise the bone in the form of the letter V, so that the lines may converge towards the point of the weapon; this being done, it must necessarily give way, and be easily extracted.

But if it has penetrated the articulation between two bones, the two limbs are to be bound up with bandages or straps, in the vicinity of the wound; these are to be drawn in contrary directions, in order to put the tendons on the stretch; which being done, the space between the bones is enlarged, so that the weapon may be withdrawn without difficulty. Care must be taken, as I have observed in other places, that no nerve, vein, or artery, be wounded by the weapon in the act of extracting it; and this may be prevented by the same means which I have already mentioned.

But if any person has been wounded by a poisoned weapon, the same means must be employed in every respect, and with all possible celerity, as if poison had been drunk, or as if stung by a serpent. When the weapon is extracted, the wound itself requires no other dressing than that which would be necessary if nothing had lodged there; concerning which I have said enough in another place."

Contemporary with Celsus were three eminent surgeons, Heliodorus, Archigenes and Antyllus, and a little later Dioscorides, in the reign of Nero (54-68 A.D.) wrote the first book on *materia medica*. Aretaeus (2-3 Century, A.D.) wrote a book on practice, the most remarkable in antiquity for literary elegance, but mainly derived from Archigenes. Two Ephesians, Rufus and Soranus, both of the 2d Century, A.D., are also outstanding figures in the medical literature of the period. The period closes with the great name of Galen (131-201 A.D.), the greatest experimenter in physiology among the ancients, the most voluminous of all the ancient physicians. Galen did much for the comparative anatomy and physiology of the nervous and locomotor systems, was the first to observe aneurism, stated the four classical symptoms of inflammation, and devised many improvements in therapy, particularly the use of milk diet and climatic treatment in phthisis. A practitioner of unusual shrewdness, he wrote the first tract on malingering or feigned diseases, which was translated three times in the 16th century, and latterly by Frölich.²¹ The Galenic system dominated European medicine for nearly seventeen centuries.

By the *lex Julia* (90 B.C.), Roman citizenship had been conferred upon all native Italians and in 46 B.C., Julius Caesar, as Suetonius

²¹Frölich: Friedreich's Bl. f. gerichtl. Med., Nürnberg, 1889, iv, 21-26.

relates, "conferred citizenship on all practitioners of medicine and all professors of liberal arts in Rome, to make them more desirous of living in the city and to induce others to come there."²² In the opinion of Marquardt, this far-sighted policy was an expression of Caesar's desire to do something for the medical service of the Roman Army.²³ The city began to swarm with physicians, eager for the *jus quiritium*, and the Roman Quirites themselves no longer disdained to study medicine. Roman physicians, such as Cassius Felix or Scribonius Largus, had already attained distinction in medical literature, and later Antonius Musa became the intimate of Horace and the physician to Augustus Caesar. Scribonius Largus served with Claudius in Britain. Galen was invited to accompany Marcus Aurelius on his campaign against the Marcomanni.

*Battle Losses in Antiquity*²⁴

In the later Greek and Roman historians, we begin to get definite statistics of battle losses, and while the figures given are large and obviously approximations, it is assumed by Frölich that they are in the main correct, for the following reasons: (1) The aim of ancient armies was not merely to cripple the enemy's forces, but to destroy them utterly, which, in itself, would imply a high mortality on the losing side. (2) In the German wars, it was impracticable and impossible for the Romans to take care of a great horde of captives and *vice versa*. (3) The Persian and Germanic thrusts were almost in the nature of folk-migrations, homeless, formless caravans of people, risking their all, without any reserve forces to rely upon, and even accompanied by women and children. It may further be noted that the lustration of Roman troops before and after a battle, in connection with the recruiting of the army by the census, constituted a very real check upon the actual numbers engaged and the losses sustained. After Caesar's bloody battle with the Helvetians in 58 B.C., a similar count of the total population and the number available for warfare was found to be inscribed on tablets in the Helvetian camp.

At Marathon (490 B.C.), 10,000 Athenians are said to have engaged 210,000 Persians, with losses of 192 Greeks and 6,400 Persians. At Plataea (479) B.C., 105,000 Greeks opposed 325,000 Persians with a loss of only 1,360 Greeks and the utter routing of the Persian forces. Of the 23,000 Greeks who marched with Cyrus against Artaxerxes in 401 B.C., only 8,000 returned. As we approach the Roman period, figures become more credible. At Asculum (280 B.C.), Pyrrhus lost 3,500 men. In the second Punic war, Regulus lost 13,500 men out of 15,500 in Africa. Hannibal started across the Alps in 218 B.C. with 100,000 infantry and 12,000 cavalry and had only 20,000 infantry and 6,000 cavalry when he reached Italy. In his victory at Lake Trasymene, (217 B.C.), 13,000 Romans were destroyed and 10,000 taken prisoner, while the Carthaginians lost but 1,500 in battle, many more dying of wounds later. At Cannae (216 B.C.), the Romans suffered the staggering loss of 60,000 killed and 10,000 taken prisoners, out of an army of 85,000. Hasdrubal lost 56,000 out of 60,000 at Metaurus (207 B.C.) and Hannibal 20,000 killed and

²² "Omnisque medicinam Romae professos et liberalium artium doctores, quo libentius et ipsi urbem incolerent et ceteri adpeterent, civitate donavit" Suetonius, Divus Julius, 42.

²³ Marquardt & Mommsen: Handbuch der römischen Alterthümer, 2 aufl., Leipzig, 1884, v, 556.

²⁴ Frölich: Ztschr. f. Krankenpflege, Berl., 1896, xviii, 41-45.

20,000 prisoners out of 50,000 at Zama (202 B.C.). When Carthage was destroyed in 146 B.C., the city of 700,000 inhabitants had been reduced to 50,000 by the Punic Wars. In the Civil War of 49 B.C., 170,000 out of 320,000 Romans were destroyed. In 113 B.C., 300,000 Cimbri began to migrate southward and eventually slaughtered 120,000 Romans (105 B.C.). In 102, Marius destroyed 200,000 Teutons at Aquae Sextiae and took 80,000 prisoners; in 101, 130,000 out of 150,000 Cimbri were killed. In 58, Caesar slaughtered 238,000 Helvetians and in the same year, defeated Ariovistus, who lost 80,000. In 57, Caesar destroyed 55,000 out of 60,000 Nervi on the Sambre. At the destruction of Jerusalem (70 A.D.), it is recorded by Josephus (VII, 17), that 1,100,000 were slain. In the revolt of the Jews against Hadrian (133 A.D.), 60,000 were slain. The great epidemics of the past, e.g., the plague at Athens, described by Thucydides and Lucretius, the Orosian, Cyprian and Antonine plagues, the epidemics attacking the Carthaginian forces at Agrigentum and Syracuse, also occasioned frightful mortality; and the introduction of malarial fever into Greece is held by Jones²⁵ to have been the cause of the decline of the Hellenic civilization.

*Later Organization of the Roman Army*²⁶

Before the bloody period of the Civil Wars, the Roman Army had been recruited by a census of property-holding citizens. In course of time the heavy infantry of the line, made up of the middle classes, came to be selected not according to property qualifications but by length of service, and the Italian allies (*socii*) had long since been permitted to serve. Following the Civil Wars, still more important changes were effected by Gaius Marius (155-86 B. C.), a man of humble origin, whose military abilities had advanced him from the plow to the consulship by 107 B. C. Before his time, the aristocracy had long since given up service in the army, the middle class had almost ceased to exist, the allies (heavy troopers from Thrace, light African cavalry, Ligurian light infantry and Balearic slingers) made up the main contingent, and voluntary enlistment of the poor had become customary. In 107 B. C. Marius made voluntary enlistment accessible to all. The maniples were now replaced by heavy cohorts, ten of which made a legion of 6,000 men. This dense rigid formation became necessary, as in the Napoleonic wars, through "the decline in morale of the rank and file" (Atkinson). "The morale of the Roman army was founded no longer on patriotism but on professional pride and *esprit de corps*" (Atkinson). These paid soldiers were usually enlisted for life; training was uniform, promotion mechanical, service became entirely professional, and as Mommsen says, the silver eagle of the legions "proclaimed the advent of Emperors." This new standing army proved, however, to be the salvation of Rome during the bloody periods of the Civil and German wars. When Octavius Caesar came to power after the battle of Actium

²⁵ W. H. S. Jones: *Malaria and Greek History*. Manchester, 1909.

²⁶ Atkinson, *op. cit.*, 595.

(31 B. C.), he had upon his hands a great army variously distributed. This he cut down to a select force of 25 legions, while the Pretorian guard, destined to become the enemies of the people and the assassins of many emperors, occupied and guarded Italy. In such a standing army of 300,000 picked men, with long terms of enlistment, the need for some sort of medical organization and administration was obvious and the means of effecting it were happily supplied by the improved social status of physicians and of medical practice in Rome.

Establishment of a Medical Service in the Roman Army

Evidence on this matter is scattered and tangential, for the reason noted by French physicians in the eighteenth century, viz., that secular historians seem to be in a conspiracy to omit all mention of medicine from their writings.²⁷ Even in the reign of Vespasian (69-79 A. D.), when the Roman army consisted of 30 legions, 10 Pretorian cohorts and auxiliary troops, medicine was still regarded as a "*negotium sordidum*." The *Constitutiones* or legal enactments of Augustus, containing his prescriptions for the reorganization of the Roman army, have unfortunately been lost,²⁸ but that he must have made due provision for a medical establishment may be inferred from the fact that he gave to all free physicians (including educated army surgeons) the equestrian dignity (*dignitas equestris*)²⁹ which conferred the right of full citizenship with the privilege of wearing the ring of the knightly class. That educated physicians (*medici*) were attached to the Roman Army before the Christian era is evident from passages in Cicero (70 B. C.), Celsus, Galen, Lucian, and the Platonist Onosander.³⁰ In the *Tactics* of Claudius Ælianus (100-140 A.D.), dedicated to Emperor Hadrian, they are distinctly classed among non-combatants (*ἄμαχοι*)³¹ and the services of legionary physicians (*medici legionis*) are commemorated in some 46 Latin inscriptions of the Empire (1st-2d Century, A.D.).³² Early in the Christian era, marked solicitude for the wounded, whether real or affected, became an almost official trait or social obligation of the Roman emperors. The crafty Tiberius (14-37 A.D.) won the favor of his troops on his Illyrian campaign by taking with him physicians, litters

²⁷ Dujardin & Peyrilhe: *Histoire de la chirurgie*, Paris, 1774-80, ii, 386, Cited by Corlieu.

²⁸ Jäns: *Geschichte der Kriegswissenschaft*, München & Leipzig, 1889, 84. Cited by Haberling.

²⁹ Dio Cassius, liii, 30, Cited by Haberling.

³⁰ Cicero: *Tusc. Disp.*, ii, 16, §38. Celsus: *De re medica. Proaemium*. Galen: *Opera*. ed Kühn, xiii, 551; 786; xiii, 604; 1031. Lucian (Teubner ed.) Leipzig, 1852, ii, 10. Onosander: ed. Köchly Teubner), i, §§ 13-14, pp. 5-6). Cited by Haberling.

³¹ In: *Griechische Kriegsschriftsteller* (Köchly & Rüstow), Berlin, 1855, pt. 2, 248. Cited by Haberling.

³² Haberling: *Die altrömischen Militärärzte*, Veröffentl. a. d. Geb. d. Mil.-San.-Wesens, Berlin, 1910, 19-76.

and a special bath for the wounded.³³ Germanicus, on the northern marches, relieved the wants of his soldiers at his own expense, "visited the sick, applauded their bravery, examined their wounds,"³⁴ while his wife, Agrippina "took upon herself the functions of a general officer, attended to the wants of the men, distributed clothes to the indigent and medicine to the sick (Tacitus).³⁵ Trajan (98–117), most firm and able of the emperors, was praised by Pliny and Dio Cassius for paying for the care of sick soldiers out of his own pocket and visiting the wounded in their tents after a battle.³⁶ This was also the custom with his successor Hadrian (117–138) and of the later emperors, including Alexander Severus (222–235) who said that he cared more for his soldiers than himself, since upon their welfare hinged and hung the welfare of the state.³⁷ The aphorism of Aurelian (270–275): "Free medical treatment for the soldier" (*Milites a medicis gratis curentur*), might well be inscribed over every military hospital. This royal solicitude for the disabled soldier in a long succession of emperors implies, in itself, a definite organization of hospitals and personnel for the care of the sick and wounded in campaign.

While no date can be assigned for the establishment of such an elaborately organized medical personnel as is apparent from the carved inscriptions, it is fair to assume that by the time of Trajan and Hadrian (98–138 A.D.), every closed formation, every legion, every warship had attached to it a physician. The column of Trajan, commemorating his victories in the Dacian campaign, shows army surgeons bandaging the wounded and wearing the arms and uniform of the legionary troops. The grammarian Hyginus, who lived sometime in this period, dedicated to Trajan his book on the munitions of Roman camps (*De munitione castrorum*), which contains an account of Roman military hospitals, the very existence of which implies a well-organized medical personnel.

Accepting the conservative conclusions of Kühn, Briau, Gaupp, Frölich, Marquardt, Haberling and Withington, the following may be inferred from the scattered information conveyed in the Latin writers, the inscriptions and the Digests of the Roman laws:

Each of the 25–30 legions, of 10 cohorts each (numbering 6500–

³³ "Jam medici, jam apparatus cibi, jam in hoc solum portatum instrumentum balinei nullius [militis] non succurrit valetudini" Velleius Paterculus: *Historia Romana*, ii, 114, §1 (Teubner, 1876, p. 115). Cited by Haberling.

³⁴ "Germanicus . . . propria pecunia militem juvit. Utque cladis memoriam etiam comitate leniret, circumire saucios, facta singulorum extollere; vulnera intuens alium spe, alium gloria, cunctos adloquio et cura sibi et proelio firmabat. Tacitus; *Annales*, i, 71.

³⁵ "Sed femina ingens animi munia ducis per eos dies induit, militibusque, ut quis inops aut saucius, vestem et fomentum dilargita est" Tacitus: *Annales*, i, 69, cited by Frölich.

³⁶ Pliny, *Panegy.* in Trajan, 13; Dio Cassius, 68. Cited by Frölich.

³⁷ *Milites se magis servare, quam se ipsum, quod salus publica in his esset.* Aelius Lampridius *Historiae augustae scriptores* sex, cap. 47. Cited by Frölich.

7000 men in all) had a legionary physician (*medicus legionis*); each of the 9 Pretorian cohorts, the 4 urban cohorts and the 7 cohorts of *vigiles* (who acted as police and firemen in the city) had four cohort surgeons (*medici cohortis*). Every body of auxiliary troops and every ship of the Pretorian fleet had also physicians. All these physicians, as part of the military establishment, were regarded as *immunes*, exempt from guard and combat duty or day labor, and ranked among the *principales* (non-commissioned officers). In the Pretorian and city cohorts, they were required to be Roman citizens, while the physicians of the *vigiles* and auxiliary troops, serving in Italy and the provinces, could be freedmen or foreigners. For this reason, the staff surgeons of these latter organizations were called *medici ordinarii*. The legionary physicians were all of equal rank, had no other medical superiors and were subordinated only to the camp commander (*praefectus castrorum*) or, in his absence, to the tribunes of the legions. The social status of the medical staff in this military hierarchy was that of the innumerable grades of non-commissioned personnel and of the highly elaborated bureaucracy attached to the army, which included accountants, notaries, registrars, secretaries and civilian functionaries of all kinds.³⁸

Military Medicine in the Inscriptions of the Empire

So much of Roman history is contained in the inscriptions of the Republic and the Empire that this branch of epigraphy has become a little science in itself. The most typical and most famous of all the Roman inscriptions is that on the Arch of Titus (72 A. D.), which immortalizes the devotion of the Senate and the people to the deified Titus and Vespasian.³⁹

SENATVS
POPVLVSQVE.ROMANVS
DIVO.TITO.DIVI.VESPASIANI.F
VESPASIANO.AVGVSTO

No less than 46 different inscriptions, giving the name, organization and rank of some 60 Roman army surgeons, have been found in different parts of Italy, Germany, Austria, England, France, Holland, Switzerland, Roumania, Bulgaria, Servia, Asia Minor, Egypt and Algeria.⁴⁰ The wide range of these finds, the gravestones of those who died in

³⁸ Marquardt & Mommsen: *Handbuch der römischen Alterthümer*, 2. Aufl. Leipzig, 1884, v, 554-557.

³⁹ The majestic capital letters of this inscription, carved by the stone-cutter as if for some supreme occasion, are identical with those familiar to us in the beautiful font of type devised by the Venetian printer, Nicholas Jenson, for the medical books published by him in 1471. They are commonly seen on public buildings, e. g., in the inscription over the central entrance of the present Munitions Building, in which the Surgeon General's Office is now housed.

⁴⁰ Haberling: *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Heft 42, Berl., 1910, 19-76.

foreign lands, is evidence in itself of the extensive medical organization of the Roman army during the first two centuries of the Christian era. Very typical is the pathetic inscription on the six-foot tombstone of a *medicus ordinarius* of the Tungrian cohort in Britain (*circa* 83, A. D.) found near the site of the Roman wall near Housesteads, and now in the Newcastle Museum:

D. M.
ANICIO
INGENVO
MEDICO
ORD. COH
I. TVNGR
VIX. AN. XXV.

D[iis] M[anibus], Anicio Ingenuo, Medico Ord[inario] Coh[ortis] primae Tungr[orum]. Vix[it] An[nis] XXV.

To the Gods of the Shades:⁴¹ Anicius Ingenuus, Ordinary Physician of the First Tungrian Cohort. He lived 25 years.

Another, found in Rome, reads:

Asclepio et saluti commillitonum. Sex[tus] Titius Alexander, medicus Coh[ortis] V. pr[aetoriae] donum dedit [Imperatore Domitiano] Aug[usto] octavum T[ito] Flavio Sabino consulibus.

Sextus Titius Alexander, physician to the Fifth Pretorian Cohort, dedicates this stone to Æsculapius and to the health of his comrades. [In the reign of Domitian.] Consulate of Augustus Titus VIII and Flavius Sabinus.

An inscription of 155 A. D., found in Kutlovica (Bulgaria) shows that a detachment of the 10th (Claudian) legion had a *medicus* among the *principales*, whence it may be inferred that each of the 10 cohorts in a legion had separate medical personnel. An inscription found in 1902 at Kistanye (Hungary) shows, carved underneath, a surgical case with instruments.⁴² An inscription from Lanuvium, deciphered by Momm-
sen, shows that legionary physicians did not serve continually with one organization, but might be transferred to others. The inscriptions of the Pretorian cohorts show that each of these had a surgeon, and sometimes also a *medicus clinicus* or internist. One found at Lyons in 1833, relating to the 13th Urban Cohort, is in memory of a *medicus castrensis* or camp physician. An inscription of the time of Hadrian, found at Rome, shows that the emperor's cavalry guard (*equites singulares Augusti*) had a troop surgeon. Two pillars set up by the second and fifth cohorts of the *vigiles*, in honor of the emperor Caracalla (212 A.D.) have engraved upon them the names of four *medici* each,⁴³

⁴¹ "Gods of gloom" is Swinburne's poetic translation of *χθόνιοι*, or Dii Manes, i. e., the shades or ghostly divinities of the infernal regions or underworld. For cut of tombstone, see Haberling, 45.

⁴² For a cut of which see Haberling, *op. cit.*, p. 24.

⁴³ For a cut of which see Haberling, p. 41.

and six of the eight names are Greek; the second inscription gives, in addition, the full roster of 13 officers and 1,000 privates. Other inscriptions show that the volunteer organizations (*cohortes civium Romanorum*), the auxiliary forces (*cohortes auxiliares*), the cavalry squadrons (*alae equitum*) and the triremes of the navy had each their own separate medical personnel. The epitaphs of the naval surgeons of the triremes "Cupid" and "Tiger," war vessels with a complement of about 200 rowers and soldiers each, specify them as *duplicarii* (receiving double pay). This compensation, Withington holds, was due to the fact that the Romans disliked the sea and that special inducements had to be held out to those undertaking this hazardous service.⁴⁴ From the 56 known inscriptions, it may be gathered that the medical administration of the Roman army and navy in the first two centuries of the Christian era was highly specialized.

Two of the naval inscriptions, and several of the military, indicate that physicians could be admitted to the services at the age of 20–21. A letter of the emperor Antoninus Pius to the legionary physician Aulus Numisius suggests that continuous service was not compulsory for army surgeons; and a sentence in the Theodosian Codex (XIII, 3, 10) establishes the fact that physicians practising in the city of Rome were required to render only a minimum of wartime service (*ad militiam minime comprehendī*).⁴⁵ In the Greek papyri of the Alexandrian period, investigated by Sudhoff, a land-grant in Egypt, given to a veteran army surgeon upon his retirement, is mentioned.⁴⁶ The pay of the legionary physician was that of the *immunes*, i. e., 225 denarii after Augustus Caesar, 300 after Domitian, 500 after Septimius Severus, while the fleet surgeons received twice these amounts.⁴⁷ Whether they paid for their medicine and instruments out of these small sums is not known. The uniform of the army surgeon in the reign of Trajan consisted of a double woolen undershirt (*tunica*), a short scalloped doublet (*focale*), leathern breeches (*bracae*) reaching to the calves, and to which the boots (*caligae*) were attached, a round metal helmet, not covering the neck, and the traditional short sword (*gladius*), attached to a belt (*balteus*).⁴⁸ His surgical kit, as described by Gurlt,⁴⁹ consisted of metal knives, scalpels, hooks, sounds, forceps, etc., carried in a long slender bronze case; oblong bronze or ivory boxes, for carrying a pocket outfit of medicines have also been found, with figures of Æsculapius and Hygieia, or of the Æscu-

⁴⁴ E. T. Withington: *Medical History*, London, 1894, 118.

⁴⁵ Cited by Haberling, p. 56.

⁴⁶ K. Sudhoff: *Aerztliches aus griechischen Papyrus-Urkunden*, Leipzig, 1909, 257–258.

⁴⁷ Haberling, p. 58.

⁴⁸ Haberling, p. 59.

⁴⁹ Gurlt: *Geschichte der Chirurgie*, Berlin, 1898, i, plates ii-iii.

lapien snake, on the covers.⁵⁰ The metal field-cases of salves have been described by Deneffe.⁵¹ Tacitus mentions the loss of bandaging material in the contest between Caecina and Arminius in the German morass,⁵² and it is related of Trajan that "when his bandages began to give out he did not spare his own clothing, but tore it into strips in order to bind up the wounds of his soldiers."⁵³

The social status of the Roman army surgeon was not high, his pay and uniform being that of the ordinary soldiery, with whom his name is grouped on the inscriptions; and from this low estate he was never advanced. But in order to attract physicians to the military service and to retain them in it, certain legal privileges were extended. In the Justinian Codex (X, 53 (52), 1, 6), it is specified that a legionary physician was to be exempted from the performance of public works, while on military duty, but not after, unless he elected to serve abroad for a long period, in which case he should later enjoy the privileges of state physicians. Another privilege was the so-called *jus restitutionis* or "right of indemnification" (Digests, IV, 6, No. 33), in virtue of which a military physician was entitled to restitution for any material damage or fraud perpetrated against him while absent on field duty. This privilege was limited by Alexander Severus to a year, but was later extended by Gordian to four years, while, in the opinion of the jurist Julius Paulus (2d Century A.D.), it had no limitation in time (Haberling).⁵⁴ The low estate of the Roman army surgeon, and his inability to lift himself and his order out of it, is partly to be explained by the inadequate medical training of his time. Although the greatest Greek physicians of the period were residents of Rome, and many Roman citizens became celebrated in the profession, there was no organization of medical education whatever until the 3d Century A. D.; and, without the aid of printed books (medical manuscripts were scarce), the legionary physicians on field duty were at a sad pass in difficult cases. This explains the various sarcasms of contemporary Greek writers to the effect that the physical exercises exacted by the general were better for the soldier's health than the ministrations of the physicians.⁵⁵ It was only after the reign of Septimius Severus (193-211 A.D.) that a state license was required for the right to practice (*medicus a republica probatus*), and Alexander Severus (222-235) was the first to have lecture

⁵⁰ Haberling, pp. 59-63.

⁵¹ V. Deneffe: *Chirurgie antique*, Anvers, 1893, 12; 33, pl. ii.

⁵² *Non fomenta sauciis*. Tacitus, Ann. i, 65.

⁵³ Trajanus imperator milites in proelio vulneratos curabat. Cum autem fasciae et volumina deficerent, ne suae quidem vesti pepercit, sed eam totam in ligamenta discidit. Dio Cassius, 68. Cited by Frölich.

⁵⁴ Haberling, 64-65.

⁵⁵ e. g. Onosander: *Ὁ στρατηγικός* i, 13-14. Cited by Haberling, p. 15.

halls built for the teaching of medicine in Rome.⁵⁶ For the advancement of military medicine, the seed thus sown was to come to best fruition in the Eastern Empire.

Roman Military Hospitals

The excavation of three Roman military hospitals, near Vienna, Bonn and the Swiss Baden, during 1887-1904, has revolutionized our knowledge of the status of hospital construction and administration in antiquity. We read of the ancient temples of Æsculapius (Asclepieia), the superstitious observances of which were ridiculed by Aristophanes, or of the later *Iatreia* or private wards in the houses of Greek physicians, or of the surgeon's operating room (as described by Hippocrates), or of the model room in the surgeon's house at Pompeii, but always with a skeptical feeling that these phases must have been rare and exceptional. Now we have the evidence of actual structures, which can be studied in the plans.

The Roman landlords eventually acquired *valetudinaria* or quarters on their estates for sick slaves, more from a gradual perception of the economic advantages of keeping slaves in good condition than from any humanitarian or ethical motives.⁵⁷ By the 1st Century B. C., this arrangement had so demonstrated its worth that *valetudinaria* for wealthy free-born citizens became common and are mentioned three times by Seneca.⁵⁸ In course of time some of these came to be large and well equipped institutions. In republican Rome, the care of the sick and wounded soldier was based upon the theory that "some knowledge of medicine was expected of every Roman citizen" (Allbutt.)⁵⁹ After the Second Punic War, the wounded were carried by the *velites* to the rear, thence to tents or huts, where their wounds were bound, or else they were billeted in the houses of the wealthy, or sent to a safeguarded place, sometimes by wagon transportation.⁶⁰ As long as fighting was within the Italian peninsula and near Rome, it was possible to shelter the wounded in private homes, or fortified places or private hospitals like the above, and such retreats were called by the architect Vitruvius "*hospitalia*;"⁶¹ but when warfare was carried into unknown and distant lands, among barbaric or semi-civilized peoples, some other arrangement had to be made. In the book of Hyginus on the munitions

⁵⁶ Haberling, pp. 65-67.

⁵⁷ M. Meyer-Steineg: Jena med.-hist. Beitr., 1912, Heft., 3, 31-34. Cato the Censor (ii, 7) recommended that old and invalid slaves be sold, like worn-out oxen or utensils; unsaleable slaves were marooned on Tiber Island to starve.

⁵⁸ Meyer-Steineg, 32

⁵⁹ Allbutt: *op. cit.*, 466.

⁶⁰ Livy, iv, 31.

⁶¹ Vitruvius: *Architectura*, vi, 10. Cited by Haberling.

of camps,⁶² provision is made for the location of two cohorts on either side of camp headquarters (*praetorium*) facing the main street, (*via principalis*); to the rear of the *praetorium* were the quartermaster's headquarters (*quaestorium*), and, on the right and left of this the *valetudinarium* or hospital for sick and wounded soldiers (*valetudinarii*), the veterinary hospital (*veterinarium*) and the blacksmith shops (*fabrica*), the latter far removed, so as not to disturb the patients.⁶³ The hospital was controlled by the camp commander (*praefectus castrorum*), and, according to Vegetius and the Digests, the hospital personnel consisted of hospital superintendents (*optiones valetudinarii*), the physicians (*medici castrorum*), the sanitary personnel (*capsarii*), who carried bandaging material in a pouch (*capsa*) and were attended by pupils (*discentes*), the paper-work personnel (*librarii*) and those who waited on the sick (*qui aegris praesto sunt*).⁶⁴ The digests specify inspection of hospitals (*valetudinarios inspicere*) as the duty of the tribunes. As noted by Briau, the hospital physicians and inspectors are commemorated in a number of inscriptions.⁶⁵

Until the discovery of the legionary camp at Novaesium, on the Roman road to Cologne, near Bonn (Lower Rhineland), by Constantin Koenen,⁶⁶ evidence as to the existence of these military hospitals was merely on paper. Koenen's excavations (1887-1901) revealed, however, at the back of the *praetorium* and adjoining the quaestor's headquarters, the remains of a stone hospital, 90 by 50 meters in dimensions, built on the corridor plan, with entrances and exits so arranged as to avoid draughts in the wards, which opened into closed corridors and quadrangles, the dining room facing the main entrance and situated between the two main quadrangles. The 38 sick wards, each 18.2 meters square, were ranged along the full length of the outer wards and inner quadrangles and were probably intended for 5-6 patients each. The hospital would therefore accommodate about 198-220 patients.⁶⁷ Many surgical instruments and ointment boxes were found in the ruins, and the late Professor Haverfield found evidence of a good diet kitchen (oysters, meat, eggs) in the rubbish pit.⁶⁸ The fortress of Novaesium was originally established by Tiberius Caesar (14-37 A.D.) but the quarters were rebuilt in stone by Claudius (41-54).

In 1904, the legionary camp at Carnuntum, on the Danube, 40 km.

⁶² Hyginus: *De munitione castrorum*, Göttingen, 1848, p. 68.

⁶³ For the arrangement of a Roman camp, with plan, see, Haberling: *Die Militärlazarette im alten Rom*. *Deutsche mil.-ärztl. Ztschr.*, Berl., 1909, xxxviii, 445.

⁶⁴ Haberling, *op. cit.*, 458-465.

⁶⁵ R. Briau: *Le service de santé militaire chez les Romains*, Paris, 1866, 24-41.

⁶⁶ C. Koenen: *Beschreibung von Novaesium*. *Bonn. Jahrb.*, 111-112, pp. 180-182.

⁶⁷ Haberling, 448-452, with plan. Meyer-Steineg: *op. cit.*, 42-44.

⁶⁸ Allbutt 488.

from Vienna, was discovered by Col. von Groller,⁶⁹ and in the statutory position behind the praetorium there were found remains of the original quadrangular camp hospital (1st century A.D.), 47.4 by 34.2 meters in dimensions, and an enlarged hospital of later date, covering 5,890 square meters, of which no less than 1,800 were devoted to an open central court.⁷⁰

Both hospitals had the same arrangement of wards, opening upon corridors (parallel with the longer walls) and the central quadrangle. It is possible that the quadrangle, like the *patio* in a Spanish house, was a flower garden. There were wards on both sides of the corridors, and remains of sewers, water-piping, a heating plant, kitchen and apothecary's shop have been found. While only two surgical instruments were excavated, an inscription on the altar of the ward attendants (*capsarii*) indicates the true character of the building.⁷¹

In 1892-6, the imposing walls of a large structure at Baden (Switzerland), some distance from the old Roman camp at Vindonissa (Windisch), were excavated, the coins found being of the time of Claudius Caesar, and the large find of surgical instruments indicating a medical establishment. As Baden is described in Tacitus as a much frequented health resort and mineral spring,⁷² Haberling assumes that this building was either a convalescent hospital or a supply depot, since it differs in plan from the hospitals at Carnuntum and Novaesium.⁷³ That many similar hospitals were put up for such large armies as the Romans maintained in Germany is highly probable.

Roman Military Sanitation

The Romans left no treatises on military sanitation, but they were an instinctively clean people, and their concern for purity of food and water and for the disposal of sewage and excreta were not without their effect upon the hygiene of armies. Caesar, like Xenophon, paid great heed to rations and to the pitching of his camp upon a height at the head of a river, near wood and water. To camp in a valley was a barbaric custom (*consuetudo barbarorum*). The architect Vitruvius and the agriculturist Columella, both of the 1st Century A. D., had an intuitive feeling that marshes engender minute living creatures which might cause pestilential fevers. Vitruvius says:

The vicinity of a marsh is to be avoided, because, when the morning airs reach the house at sunrise, the mists of these places arrive with them, and the wind, mixed

⁶⁹ von Groller: *Der römische Limes in Oesterreich*, Wien, 1906.

⁷⁰ For plans of Carnuntum, see Haberling, 453; 455. Meyer-Steineg, 36.

⁷¹ Haberling, 452-458. Meyer-Steineg, 35-42.

⁷² "Locus, amoeno salubrium aquarum usu frequens." Tacitus: *Historia*, i, 67.

⁷³ Haberling, 458.

with these vapors, spreads the poisonous exhalations of the creatures inhabiting the marsh, and so make the place pestilential. (I, 4.)

Columella says:

Nor should buildings be erected near a marsh nor a military road adjoin it, because through heat it gives forth noxious poisons and engenders animals around with dangerous stings, which fly at us in dense swarms. (I, 5.)

The mosquito net or canopy (*conopeum*) is ridiculed by Horace (Epodes, IX, 16) Juvenal (VI, 80) and Propertius (III, 11, 45). Vitruvius' treatise on architecture contains a careful survey of the diseases caused by bad water supply and exposure to the elements; recommends massive ingestion of water in constipation and calculus; the use of warm baths in gout, paralysis and the neuroses; and treats informingly of the quality of the air, climate, acclimatization, water-supply, filtration of water, mineral springs, the soil as a site for building, the hygiene and lighting of habitations and other buildings, the planning of towns and their water-supply.⁷⁴ That this view of architecture as a branch of sanitation (Lord Kelvin's view) was no mere sterile theory is evident from the actual remains of the spacious public buildings and military hospitals and the gigantic sewer-courses. The Roman scheme of physical training was not, as with the Greeks, a joyous, spontaneous *plein air* cult, but had the same rigorous practical tendency, and was concentrated on infantry and cavalry drill and tactics, held twice daily in the case of recruits, with such exercises as jumping, swimming, fencing, archery and equitation.⁷⁵ The gladiatorial shows, as Lecky maintains, were designed to harden the people to the bloody and brutal aspects of warfare as a primary function of the Roman state.⁷⁶ The most memorable picture of the Roman army as a mechanism of precision, in its most efficient period, comes from an unexpected source, namely, the Jewish historian Flavius Josephus (born 37 A. D.), who, originally a priest, had himself seen military service under Vespasian, and wrote as eye-witness:

Now here one cannot but admire at the precaution of the Romans, in providing themselves of such household servants, as might not only serve at other times for the common offices of life, but might also be of advantage to them in their wars. And, indeed, if any one does but attend to the other parts of their military discipline, he will be forced to confess, that their obtaining so large a dominion hath been the acquisition of their valour, and not the bare gift of fortune; for they do not begin to use their weapons first in time of war, nor do they then put their hands first into motion, while they avoided so to do in times of peace; but as if their weapons did always cling to them, they have never any truce from warlike exercises; nor do they stay till times of war admonish them to use them; for their military exercises differ

⁷⁴ A. Söllner: Die hygienischen Anschauungen des römischen Architekten Vitruvius. Jena med. hist. Beitr., 1913, Heft 4, 1-64.

⁷⁵ J. Marquardt & Th. Mommsen: Handbuch der römischen Alterthümer. Leipz., 1884, V. 567

⁷⁶ W. E. H. Lecky: History of European Morals.

not at all from the real use of their arms, but every soldier is every day exercised, and that with real diligence, as if it were in time of war, which is the reason why they bear the fatigue of battles so easily; for neither can any disorder remove them from their usual regularity, nor can fear affright them out of it, nor can labor tire them; which firmness of conduct makes them always to overcome those that have not the same firmness; nor would he be mistaken that should call those their exercises unbloody battles, and their battles bloody exercises. Nor can their enemies easily surprise them with the suddenness of their incursions; for as soon as they have marched into an enemy's land, they do not begin to fight till they have walled their camp about; nor is the fence they raise rashly made, or uneven; nor do they all abide in it, nor do those that are in it take their places at random; but if it happens that the ground is uneven, it is first levelled; their camp is also four square by measure, and carpenters are ready with their tools to erect their buildings for them.

As for what is within the camp, it is set apart for tents, but the outward circumference hath the resemblance to a wall, and is adorned with towers at equal distances, where between the towers stand the engines for throwing arrows and darts, and for slinging stones, and where they lay all other engines that can annoy the enemy, all ready for their several operations. They also erect four gates, one at every side of the circumference, and those large enough for the entrance of the beasts, and wide enough for making excursions, if occasion should require. They divide the camp within into streets very conveniently, and place the tents of the commanders in the middle, but in the very midst of all is the general's own tent, in the nature of a temple, insomuch that it appears to be a city built on the sudden; with its market-place, and place for handicraft trades, and with seats for the officers, superior and inferior, where if any differences arise, their causes are heard and determined. The camp, and all that is in it, is encompassed with a wall round about, and that sooner than one would imagine, and this by the multitude and the skill of the laborers; and if occasion require, a trench is drawn round the whole, whose depth is four cubits, and its breadth equal.

When they have thus secured themselves, they live together by companies, with quietness and decency, as are all their other affairs managed with good order and security. Each company hath also their wood, and their corn, and their water brought them, when they stand in need of them; for they neither sup nor dine as they please themselves singly, but all together. Their times also for sleeping and watching, and rising, are notified beforehand by the sound of trumpets, nor is anything done without such a signal; and in the morning the soldiery go every one to their centurions, and these centurions to their tribunes, to salute them; with whom all the superior officers go to the general of the whole army, who then gives them of course the watchword and other orders, to be by them carried to all that are under their command; which is also observed when they go to fight, and thereby they turn themselves about on the sudden when there is occasion for making sallies, as they come back when they are recalled in crowds also.

Now when they are to go out of their camp, the trumpet gives a sound, at which time nobody lies still, but at the first intimation they take down their tents, and all is made ready for their going out; then do the trumpets sound again, to order them to get ready for the march; then do they lay their baggage suddenly upon their mules, and other beasts of burthen, and stand, as at the place of starting, ready to march; when also they set fire to their camp, and this they do because it will be easy for them to erect another camp, and that it may not ever be of use to their enemies. Then do the trumpets give a sound the third time, that they are to go out, in order to excite those that on any account are a little tardy, that so no one may be out of his rank

when the army marches. Then does the crier stand at the general's right hand, and asks them thrice in their own tongue, whether they be now ready to go out to war or not? To which they reply as often, with a loud and cheerful voice, saying, We are ready. And this they do almost before the question is asked them: they do this as filled with a kind of martial fury, and at the same time that they cry out, they lift up their right hands also.

When after this, they are gone out of their camp, they all march without noise, and in a decent manner, and every one keeps his own rank, as if they were going to war. The footmen are armed with breastplates and headpieces and have swords on each side, but the sword which is upon their left side is much longer than the other, for that on the right side is not longer than a span. Those infantrymen also that are chosen out from the rest to be about the general himself, have a lance and a buckler, but the rest of the infantry have a spear, and a long buckler, besides a saw and a basket, a pickaxe, and an axe, a thong of leather, and a hook, with provisions for three days, so that an infantryman hath no great need of a mule to carry his burdens. The cavalry have a long sword on their right sides, and a long pole in their hand; a shield also lies by them obliquely on one side of their horses with three or more darts that are borne in their quiver, having broad points, and not smaller than spears. They have also headpieces, and breastplates, in like manner as have all the infantry. And for those that are chosen to be about the general, their armor no way differs from that of the horsemen belonging to other troops; and he always leads the legions forth to whom the lot assigns that employment.

This is the manner of the marching and resting of the Romans, as also these are the several sorts of weapons they use. But when they are to fight, they leave nothing without forecast, nor to be done off hand, but counsel is ever first taken before any work is begun and what hath been there resolved upon is put in execution presently; for which reason they seldom commit any errors, and if they have been mistaken at any time, they easily correct those mistakes. They also esteem any errors they commit upon taking counsel beforehand, to be better than such rash success as is owing to fortune only; because such a fortuitous advantage tempts them to be inconsiderate, while consultation, though it may sometimes fail of success, hath this good in it, that it makes men more careful hereafter; but for the advantages that arise from chance, they are not owing to him that gains them; and as to what melancholy accidents happen unexpectedly, there is this comfort in them, that they had however taken the best consultations they could to prevent them.

Now they so manage their preparatory exercises of their weapons, that not the bodies of the soldiers only, but their souls, may also become stronger; they are moreover hardened for war by fear, for their laws inflict capital punishments, not only for soldiers running away from their ranks, but for slothfulness and inactivity, though it be but in a lesser degree; as are their generals more severe than their laws, for they prevent any imputation of cruelty toward those under condemnation, by the great rewards they bestow on the valiant soldiers; and the readiness of obeying their commanders is so great, that it is very ornamental in peace; but when they come to a battle, the whole army is but one body, so well coupled together are their ranks, so sudden are their turnings about, so sharp their hearing, as to what orders are given them, so quick their sight of the ensigns, and so nimble are their hands when they set to work, whereby it comes to pass, that what they do is done quickly, and what they suffer they bear with the greatest patience. Nor can we find any examples where they have been conquered in battle, when they came to a close fight, either by the multitude of the enemies, or by their stratagems, or by the difficulties in the places they were in, no, nor by fortune neither, for their victories have been surer to

them than fortune could have granted them. In a case, therefore, where counsel still goes before action, and where, after taking the best advice, that advice is followed by so active an army, what wonder is it that Euphrates on the east, the ocean on the west, the most fertile regions of Libya on the south, and the Danube and the Rhine on the north, are the limits of this empire? One might well say, that the Roman possessions are not inferior to the Romans themselves.⁷⁷

Public Works Performed by the Roman Army

Until very recent years, little has been known of the streets, sidewalks, gutters, sewers, drains, cesspools, public fountains and water-courses of the great cities of antiquity.

The wide well-paved streets and sidewalks, the sewers and stone privies found by Place at Khorsabad (720 B. C.), the gigantic drains and sewers of Babylon, a city twice the size of London, the model arrangements of streets and sanitary features of Priene (Greece) and Pompeii (Rome) have been the admiration of all visitors at museums and sanitary expositions, and in these matters Rome yielded to none. The rules for the construction of its streets were writ large in the Laws of the Twelve Tables. Macadamized embankments with sidewalks were introduced by Appius Claudius (312 B. C.). The general paving of streets in the city and macadamizing of roads was pushed with remarkable energy in 174 and street-cleaning under four aediles was established by the *lex municipalis Julia* of Caesar (45 B. C.). The Cloaca maxima, frequently clogged with refuse but always cleaned again with Roman energy, eventually disposed of the entire sewage, and by 315 A. D., there were 144 public latrines and 116 *necessariae* along the Aurelian Wall.⁷⁸ A similar arrangement has been found in the Roman military station at Timgad in the Sahara (Boissier).⁷⁹ The manner in which these public works were carried out all over the vast empire is germane to our subject.

The ruling principle of the Roman army was that no man should be kept idle. Discipline was the strictest conceivable. Desertion, cowardice in battle and insubordination were punishable by death, executed either by soldiery or the imperial lictors; whole commands were decimated by drawing lots and deserters to the enemy were thrown to wild beasts.⁸⁰ Under this harsh régime, the whole army was utilized in time of peace for the construction of public works, and it is of record that the walls and fortifications on the boundary of the empire and in Britain, the many military roads, all forts, barracks and military hospitals, many temples and public buildings, as well as canals, bridges, sewers and water-courses were constructed by Roman soldiery, under the direction of technicians. Mining, as well as the dredging of harbors and the drainage of swamps were also part of this duty, in fact, the general sanitation of the empire was largely the work of the army.⁸¹

⁷⁷ Josephus: *Bellum Judaicum*, iii, 5. Translation of William Whiston.

⁷⁸ H. A. Nielsen: *Die Strassenhygiene im Altertume*. Arch. f. Hyg., München & Berlin, 1902, xliii, 85-115.

⁷⁹ G. Boissier: *L'Afrique romaine*, Paris, 1893. F. W. Hall, *Timgad, The Pompeii of Algeria* Discovery, Lond., 1921, ii, 292.

⁸⁰ Marquardt & Mommsen: *op. cit.*, p. 571-573.

⁸¹ Marquardt & Mommsen: *op. cit.*, 568-574

How an empire so wonderfully organized could have fallen has exercised some of the best wits since Gibbon's time. Gibbon wrote the *Decline and Fall* to prove that the growth of Christianity was the efficient cause, but his famous sarcasm about the early Christians, that "their aversion to an active life contributed rather to excuse them from the service than to exclude them from the honors of the state and the army"⁸² has long since gone up in smoke. The forward-looking emperors, beginning with Augustus Caesar, appear to have recognized that an empire so constituted as the Roman could not run forever, and relied mainly upon the Army to keep things going. Such a mechanism was, in fact, like a clock wound up to run a certain length of time and predestined to run down after a definite interval. That the empire should have lasted full 500 years, that Roman history covers 1,200 years, is the surprising thing. Very interesting it is to read in Suetonius of the keen desire of Augustus that the ancient traditions of republican Rome should be maintained, of his private consultations with the magistrates, the Senate and Tiberius as to the condition and future chances of the empire, of his long period of mourning for the lost legions of Varus, destroyed in the German wars;⁸³ and while most of the emperors from Augustus down were of the "sexual-intellectual" type so dangerous to modern states,⁸⁴ the best of them were exemplars of that union of strength and sagacity, of firmness and mildness, which made the name of Rome everywhere respected. Of the ultimate decadence of manners and morals the third satire of Juvenal tells more than enough. Wells scores a number of strong points: the childlike delight in cruelty, as if "the misshapen hairy paw" of Neanderthal man were thrust at us by a morning caller; the mental infantilism which cultivated augury, ignored geography and snubbed science and medicine; the "rich man's culture" of the imperial city which was only veneer; the consequent apathy of the population to the vices of the Caesars and the invasion of the barbarians; the steady depopulation of the empire,⁸⁵ all which had more to do with the dissolution of the mercenary army than the attitude of the early Christians. The Roman nobles of the decline did not even trust the barbarians they had hired to guard their frontiers. The

⁸² Gibbon: *Decline and Fall of the Roman Empire*, ch. xv.

⁸³ Suetonius: *Divus Augustus*, 23-25, 28, 31, 35-40, 73, 98.

⁸⁴ The most striking example is Tiberius, the tiger cat on the throne, who used the *lex de maiestate* to destroy many of the best of the Roman aristocracy and whose senile vices at Capri are untranslatable. A youth of sensible character and behavior, Tiberius lived to see his own mother taken from his father by Augustus and was later required to divorce his wife, to whom he was deeply attached, in order to marry the same emperor's dissolute daughter. Brooding over these tyrannies undoubtedly did much to produce the cryptic mind which made no man's life safe while Tiberius reigned. The splendid head, of the busts in the Naples Museum, tells of his vast administrative abilities; the eyes, even in the cold stone, are those of a wild animal.

⁸⁵ Wells: *Outline of History*, ch. xxvi-xxviii.

execution of Stilicho at Ravenna gave Alaric his opportunity; what followed was but a foregone conclusion. But even as the Greek civilization is our best intellectual heritage, so republican Rome has been the world's great school for the development of manly character, of the centric idea that virtue derives from *vir*, a man. In the words of Thoreau:

The fact that the Romans once inhabited her reflects no little dignity on Nature herself; that from some particular hill the Romans looked out on the sea. She need not be ashamed of her children.

CHAPTER IV

The Middle Ages

Modern science properly begins with the work of Copernicus and Vesalius (1543), but in the social history of Europe, the Middle Ages comprise the period between the downfall of the Western and the Eastern Roman Empires (476–1453 A. D.). During this long interperiod of nearly a thousand years, printing, firearms and the mariner's compass were invented, but science sank to a comparatively low level, and while there was a remarkable upward trend in the thirteenth century and much was eventually accomplished in military surgery and preventive medicine, anatomy, physiology and pathology were almost non-existent and internal medicine sank into what Allbutt styles "unexampled and even odious degradation." The reason for all this is not far to seek. Even before the downfall of the Western Roman Empire, Greek science had died out utterly, Greek philosophy had proved a total failure, and with the downfall of Rome, Europe became practically nationless, her peoples continually at the mercy of fierce wandering tribes of barbarians and reduced to the apathetic condition described in Shakespeare's line

"The indifferent children of the earth."

The successive blows dealt by Ostrogoth and Visigoth, Vandal, Hun and Lombard might be described as an effective macing of the human intellect, destroying all ambition, all initiative and almost all productive power. While the Orient maintained her commerce and her culture, Western Europe was reduced to a peasant status in respect of agriculture, commerce, finance, education and means of self-defense. It was a period in which everything had to be begun again, in which the older edifice of science was slowly scrapped, to be rebuilt from the ground up. What saved European civilization from utter destruction was the previous Latinization of the West by the Roman power, the conversion of the barbarians to Christianity, the upbuilding of new nations through the failure of the Feudal System, and the preservation of the literary remains of antiquity by Byzantium, Islam and the monks of the Roman Church. The growth of Christianity exerted a refining influence upon morals and a softening effect upon manners, and through these influences the Germanic and Norman conquerors were, in a manner, Latinized. In the long run Pope and Emperor did much for medicine through the founding of universities,

the enactment of laws regulating medical practice, the development of hospitals and the organization of sick nursing. For science, however, the period was one of long, tedious gestation, aptly described by Singer as "the embryology of modern thought," and during the 12th century, medicine was dominated by "the heavy hand of the Arabian" (Osler).

Byzantium

The Western Roman Empire lasted 500 years. The Eastern Empire lasted nearly a thousand years (395–1453). This was accomplished by the maintenance of an ironclad military despotism and bureaucracy and through the fact that the whole Eastern Empire was eventually encysted, as in a "calcareous shell,"¹ within the ramparts of Constantinople. The effect of this imposition of Roman administrative machinery upon a population ultimately Greek in cast was to keep science stationary until it finally went into retrogression. Byzantium was thus a kind of cold storage plant for the remains of Greek culture, or, as Allbutt puts it: "The chief monuments of learning were stored in Byzantium until Western Europe was fit to take care of them."² Byzantium, therefore, had no mediæval period but led an independent, stationary existence all its own, marking time in the past. The traditions of Roman law and military science were rigorously maintained, and this civilization maintained a higher general level than that of any other European state during the Middle Ages. Its history is a monotonous record of

Half-emperors and quarter-emperors,
Each with his bay-leaf fillet, loose-thonged vest,
Loric and low-browed Gorgon on the breast, . . .
Born in the porphyry chamber at Byzant.³

But in the history of military medicine the Eastern Empire becomes of singular importance. Long before the fall of Rome the military system of the Western Empire had gone to seed, its proud legions split up into small detachments of mercenary barbarians and confined to the provinces of Italy. The name "legion" last appears in the *Notitia dignitatum* of the city of Constantinople (395–407) and disappears after the time of Justinian. The names of Roman army surgeons have already disappeared from the carved inscriptions by 250 A. D.⁴ A century later the absolute lack of proper arrangements

¹ Allbutt: Glasgow, M.J., 1913, 4. s., lxxx, 323.

² Allbutt: Science and Mediaeval Thought. London, 1901, 65.

³ Robert Browning: Protus.

⁴ Haberling: Veröffentl. a. d. Geb. d. Mil.-San.-Wesens. Berlin, 1910, Heft. 42, 67–71.

for care of the wounded in a battle fought by Julian and Constans against the Chionites is lamented by Ammianus Marcellinus.⁵ In Byzantium, however, after the reign of Justinian (527–565), we find a typically modern army, organized in brigades and divisions, with field forces of disciplined regulars (financed by scutage), a complete territorial system of recruiting (5,000 men from each military district), with frontier militia, supply depots and trains, engineers, medical corps, and such organization and training as were not to be found in the West until during the 16th-17th centuries.⁶ That the medical personnel was adequate is indicated by the anecdote of the historian Procopius (a field commander under Belisarius), in which the life of Arses is saved, after a consultation, by the clever surgery of “one of the physicians” (τῶν τῆς ἰατρῶν).⁷ In his treatise on strategy⁸ the Emperor Mauritius (582–602) introduced a kind of sanitary formation for his cavalry, consisting of 8-18 unarmed *deputati*⁹ assigned to every detachment (βάνδον) of 200 to 400 men, in addition to physicians (ἰατροί). This sanitary personnel, later called *scribones*,¹⁰ followed the fighting columns at a distance of 200 feet in order to bring the severely wounded out of danger during an engagement. To this end the saddles of their horses had two ladder-stirrups on the left side, and flasks of water were carried to revive the faint. The bearers received a piece of gold for every wounded soldier rescued, and as they collected the arms of the wounded and of the survivors after a battle (to prevent plundering), they came in for a share of the booty.¹¹ The same organization is again described, 300 years later, in the Tactics of Emperor Leo (886–912),¹² showing the rigidity of Byzantine military administration.

⁵ Frölich: Arch. f. klin. Chir., Berl., 1880, xxv, 311. Frölich translates this passage as follows: “Each side looked after its wounded as best it could and according to the number of attendants (*curantes*); some, severely wounded, and bleeding to death, reluctantly breathed their last; others, transfixed by spears and fallen to the ground, were cast aside, as if corpses; others had so many wounds that it was forbidden to do anything for them, that these suffering ones should not be further tormented by useless manhandling; many, on account of the uncertain issue in the withdrawal of weapons from wounds, suffered agony worse than death.” Ammianus Marcellinus: Rerum Gestarum, xix, 215. Haberling cites further the case of Emperor Valentinian, who, sustaining a hemorrhage on the Danube (325 A. D.), could not obtain a physician to do venesection, because all his army surgeons were engaged in combating an epidemic in camp.

⁶ Capt. C. F. Atkinson: Encyclop. Britann., 11th ed., Cambridge, 1910, ii, 596.

⁷ Procopius: De bello Gothico, ii, 2 (Teubner, 157–158). Cited by Haberling, *op. cit.*, p. 69.

⁸ Mauritius: Ars militaris, ii, 8. Cited by Kühn and Frölich.

⁹ According to Kühn, the reading is either *δεσποτάτος*, drink-giver, or *διποτάτος* (*deputatus*), one deputized or assigned to a particular task. Both readings, Kühn says, are employed in the Tactics of Leo.

¹⁰ *σκριβονες* is construed by Frölich as the equivalent of the *milites hastati* of the later Latin writers, i. e., those who guarded the person of the general and were often sent by the emperor on commissions in the distant provinces., Kühn. Program vii, Leipzig, 1826, 7. footnote 1.

¹¹ Frölich, 313–314.

¹² Leonis imperatoris *Tactica*, iv, 15; xvi, 51; 53; 119. Cited by Kühn and Frölich.

The army surgeons are classed by Leo as non-combatants (*ἄμαχοι*), the litter-bearers (*deputati*) are chosen from the weaker elements in the command, and the old arrangements about ladder-stirrups and water-flasks are maintained. In the *Tactics of Constantine VII Porphyrogenitus* (911–959)¹³ the selfsame organization is monotonously preserved. The *Tactics of Emperor Leo*, regarded as the best of all the Byzantine treatises on military science, contains at the end an impressive passage on the absolute necessity of medical personnel to armies, and the following charge to the commanding general on the care of the wounded:

Give all the care you possibly can to your wounded, for if you neglect them, you will make your soldiers timorous and cowardly before a battle, and, not only that, but your personnel, whom you might preserve and retain by proper consideration for their health and welfare, will be otherwise lost to you through your own negligence.¹⁴

On the score of military hygiene, Byzantine practice was probably based upon the precepts in the treatise on military science of Vegetius,¹⁵ who lived in the reign of Valentinian II (375–392 A. D.).

Vegetius maintains that large bodies of troops should not camp too long in any one place, since epidemic diseases arise from corruption of the air and water and can only be prevented by frequent change of camp. Troops should not camp upon dry hillsides, devoid of shade, and, in summer, should always be provided with tents. One drink of polluted water may be “as potent as poison” in starting an epidemic. Daily exercises, in the opinion of experienced commanders, are better for the health of soldiery than physicians. In periods of great heat all marching should be done before sunrise. In winter little can be expected of the soldier if he is allowed to freeze. There should be no lack of fuel and clothing. Hunger is more cruel than the sword. Recruits from cold climates are hardier and more resistant to disease than those from warmer climes; and the army must be continually strengthened by recruits from the farmlands, who are stronger than the city-bred. The recruit should be young, but strength is more essential than size; he should be keen-eyed, with head erect, broad chest, long muscular arms, capable hands, slender flanks, with thighs, calves, and feet not distended by superfluous flesh but hard with accumulated muscle. It is best to discharge the unfit at once. It is the duty of commanding officers to provide good water, proper food and medical attention for the sick. The camp commander should look after the patients in their tents, the physicians who attend them and the expenses incident thereto.

In Byzantium some provision appears to have been made for asylums for disabled soldiers, e. g., the perhaps mythical retreat said

¹³ Constantine: *βίβλιον τάκτικρον* (ed. Meursius, 1617. p. 1280). Cited by Kühn and Frölich. In closing references from the Greek and Latin writers it may be repeated that all the important bibliographical references to military medicine in classical antiquity were first given by C. G. Kühn in the academic programs published by him at Leipzig in 1824–27. Had these Latin dissertations been translated into a modern language, much labor might have been saved to all subsequent investigators and Kühn would have been credited with his actual performance, viz., the first and, in its time, the most exhaustive investigation of the whole subject before Briau and Frölich.

¹⁴ Leo: *Tactica*. Epilogue (Leyden, 1612, p. 381). Cited by Haberling, p. 70.

¹⁵ Vegetius: *De re militari*, iii, 2. Cited and translated by Frölich, *op. cit.*, 311–312.

to have been founded by Zotikos at the instance of Constantine (306–337), the Lobotropheion of Justin II (565–578) for crippled soldiers, and the Orphanotropheion of Alexis Comnenus I (1081–1118) for sick and invalided soldiers.¹⁶

The medical texts of the Byzantine period are, in the main, compilations, but the principal writers, Oribasius, Aetius and Paul, have preserved in their texts much of earlier Greek medicine that might otherwise have been lost. Aetius describes tonsillotomy, urethrotomy, operative treatment of hæmorrhoids and ligation of the brachial artery above the sac for aneurism. Alexander of Tralles (525–605) first recommended colchicum for gout, perhaps the most common malady at the Byzantine court.¹⁷ The sixth book of the Epitome of Paul of Ægina (625–690) is the best treatise on surgery in its period and was the standard source of authority up to the twelfth century. The chapter on military surgery (VI, 88) has been Englished by Francis Adams in his translation of Paul (Sydenham Society, ii, 418–422). Like that in Celsus it deals with the extraction of spear and arrow points, and was copied later by all the Arabian physicians.

The different kinds of weapons are minutely described, and while the general directions for extraction follow the lines laid down by Celsus, more than half of Paul's chapter contains new material, on the extraction of missiles from the different organs and viscera and on the treatment of wounds from the poisoned arrows used by the Dacians and Dalmatians to destroy wild animals. He points out that extensive suppuration of viscera like the liver, omentum, peritoneum and uterus, may not necessarily be fatal; describes the characteristic symptoms of wounds of the brain and its membranes, and of the chest, lungs, heart, diaphragm, abdominal viscera and bladder in an entirely modern manner, with good practical directions for removal of the missile from these parts. He recommends tracheotomy in angina, trephining in wounds of the brain, and ligation on both sides in wounds of the arteries.

In wounds of important viscera, with fatal symptoms, and where extraction would lacerate delicate tissues, Paul recommends that "we decline the attempt, lest while we do no good we expose ourselves to the reprobation of ignorant people. But if the result be dubious, we must make the attempt, having first given warning of the danger." For reasons which will appear, this rule became the guiding principle of all surgeons up to the 16th century.

¹⁶ K. Sudhoff: Jahresk. f. ärztl. Fortbild., München, 1917, viii, 46. In the ancient Greek cities the ἀδύνατοι, or permanently disabled war *invalides*, were given a small daily pension, increased to large sums by Alexander the Great in his Indian campaigns. In Rome, separate colonies for *invalides* were set apart, e. g., at Italica in Spain by Scipio Africanus, at Nicopolis in Asia Minor by Pompey, and also in Egypt (Sudhoff: *op. cit.*, 45). In the Codex of Theodosius (379–395 A. D.), veterans and *invalides* could hold lands without taxes and were provided with seed, fruits, cattle and money to run their farms. For the Latin text and commentary, see Sudhoff: Mitt. z. Gesch. d. Med., Leipz., 1917, xvi, 431–433.

¹⁷ See E. Jeanselme: La goutte à Byzance. Bull. Soc. franç. d'hist. de méd., Paris, 1920, xiv, 137–164.

Islam

(732-1096)

The Mohammedan power converted the straggling desert clans into military and social units, capable of acting as nations, and, once it had established itself, proved highly favorable to the arts and sciences. The Saracens preserved the remnants of Greek culture, were pioneers in chemistry and geology, had a most extensive pharmacopœia, built great hospitals and numbered some of the greatest physicians of the time. What little we know of their military medicine is contained in the writings of these men, for there is no mention of the subject in the Arabian Nights.

Of the physicians of the Eastern or Bagdad Caliphate (750-1258), the clinician Rhazes (860-932), famed for his original account of small-pox and measles, gives in his *Almansor* (XIII, 6), a number of sensible precepts on military hygiene:

Camps should be pitched in summer on hills and high places, tents being directed towards the north wind, with plenty of air-space between tents. Animals should be kept as far from the tents as possible. In winter camps should be placed in low-lying places, preferably at the foot of hills or mountains, tents being directed towards the east and south, alternate pairs of tents being joined together. When moist south winds blow, rations should be cut down, wine should be interdicted and more military exercises taken. When the air is dry, just the opposite régime should be enforced. Sick cattle should be kept far from the camp, in low windless places. Dangerous living animals about the camp should be driven away or smoked out of their holes and destroyed. Poisonous, odorous plants and trees should be burned or the camp site should be above them. Food and drink, as causing many diseases, should be inspected with great caution.¹⁸

The same work contains (xxv, 7) a chapter on the extraction of spear-points and darts, which adds nothing new to what is already given by Celsus and Paul. The same thing is true of the chapter on military surgery (IV, 4 fen. II, 10) in the *Canon of Avicenna* (980-1036),¹⁹ otherwise one of the greatest of physicians, the founder of geology, who described anthrax and who practised the Hippocratic method of treating spinal deformities by forcible reduction.

In the Western or Cordovan Caliphate (655-1236) flourished Albucasis (eleventh century), greatest of the Arabian surgeons, whose treatise became the standard authority after Paul. The *Altasrif* of Albucasis contains (X, 84-85, 94) chapters on the treatment of thoracic and visceral wounds and the extraction of arrows, which follow the lines laid down by Paul, particularly in semeiology, and are interesting

¹⁸ Translated by Frölich in *Arch. f. klin. Chir.* Berl., 1882-83, xxviii, 864.

¹⁹ See Frölich: *Arch. f. Klin. Chir.* Berl., 1884, xxx, 745-752.

as containing pictures of the surgical instruments employed and several clinical cases.²⁰

The Feudal System

On Christmas Day, 800 A. D., Charlemagne was crowned in St. Peter's and the Holy Roman Empire came into being. When this vast empire was partitioned after his death (814), feudalism gained its ascendancy. Although Charlemagne's own army was a strong organization of veterans, with supply trains, financed upon the democratic principle that every 3-4 men in the kingdom should maintain one of themselves as a soldier,²¹ feudal armies were levied upon a territorial basis, on the theory that the king received his lands from God and parcelled them out to his vassals in return for 1-3 months' military service per annum, rendered when occasion required. This arrangement was carried down to the serfs or villeins, who tilled the soil. Magnificent in theory, the effect of feudalism in practice was toward extreme individualism and decentralization. Each powerful vassal became a little monarch in his own right, often at odds with his sovereign, and military operations of moment were carried forward with difficulty. Raids and assaults by mailed cavalry were the principal mode of offensive, the infantry, made up of undisciplined peasantry, went into decline,²² and chivalry and knight-errantry being individualistic and aristocratic, led to lawlessness and operated fatally against true military discipline. The effect of this order of things upon military medicine was in every way pernicious. The few capable physicians and surgeons of the time were attached to the persons of kings, popes, nobles, princes of the church, and other mediæval overlords, and accompanied military leaders on their campaigns, but nothing whatever was done for the health and well being of the individual soldier. Body-physicians of great personages were richly rewarded for their services, but the surgical treatment of the common people was in the hands of wandering incisors, barber-surgeons and quacks of outcast status. There was no organization for the relief of the wounded, and as late as the sixteenth century Montluc declared that the best thing that could happen to a fighting man in battle was to be killed outright by a good arquebusade.²³ In a disorganized state of society, in which every strong overlord might be against his master or his fellows, surgical practice, even in the best hands, was sometimes bungling, came to be interdicted by the Church

²⁰ For the military surgery of Albucasis, see the account by Francis Adams in his *Paulus Ægineta*, Sydenham Society, London, 1846, ii, 424-425; and Frölich: *Arch. f. klin. Chir.*, Berl., 1884, xxx, 364-376.

²¹ Atkinson: *op. cit.*, 596.

²² Atkinson, 596-597.

²³ Cited by L. Thomas: *Lectures sur l'histoire de la médecine*, Paris, 1885, 17.

(*Ecclesia abhorret a sanguine*), and was despised and feared by the nobles as well as the people. The mediæval epics and romances of chivalry describe the agony of uncertainty, even upon the withdrawal of a spear from a wound, as worse than death itself. The greatest surgeons of the time advised their professional brethren not to undertake a major operation upon a great person without a definite guarantee of their personal safety, since they were liable to torture, mutilation or murder, in the event of a fatal issue. Operations like lithotomy, couching for cataract, and radical cure of hernia passed into the hands of outcast or barber-surgeons, and from this class came eventually such remarkable men as Paré, Felix Würtz and some of the earlier surgeons general of the Prussian Army. Of this rehabilitation of operative surgery by the lower caste, Allbutt says conclusively:

Happily, if to the high stomachs of our mediæval forefathers, surgical dabbings were common and unclean, still there remained some eyes curious enough and some fingers dexterous enough to carry the art back to the skill of Hippocrates and forward to the skill of Lister, and by the mouths of barbers and cutters, rather than of the pharisees of the colleges, medicine breathed her lowly message to her children.²⁴

The Crusades

(1096–1272)

In the ninth century the Scandinavian Vikings began their raids upon the high seas, but wherever they established themselves, whether in Russia, France, England or Sicily, they were easily assimilated by the peoples among whom they settled and were rapidly converted to Christianity. As we see their lithe figures in the Bayeux Tapestry or the cathedral windows at Chartres, clad in chain-mail armor, from neck to knee, with pointed helmets, long shields and spears, the actions depicted suggest the incessant itch for fighting which was to make them, as Wells says, "the will and power of the Crusades."

In preaching the First Crusade at Clermont in 1095, Pope Urban II said:

Up till now, ye have undertaken unjust wars; in your insensate fury ye have discharged upon one another's houses the arrows of avarice and pride. Now, I propose to you wars which bring in themselves the glorious recompense of martyrdom, which will be the subject of eulogies from the present time to posterity.²⁵

In like manner, the Abbé Guibert de Nogent said:

Before the people set out upon this great expedition, the Kingdom of France was given over to trouble and the most cruel hostilities. Brigandage, incendiarism, attacks upon the public highways, combats excited only by unbridled cupidity, went on everywhere and without cessation.²⁶

²⁴ Allbutt: *The Historical Relations of Medicine and Surgery*. London, 1905, 119–120.

²⁵ Cited by Cabanès: *Chirurgiens et blessés à travers l'histoire*. Paris 1918, 84.

²⁶ Guibert de Nogent: *Gesta Dei per Francos*. Cited by Cabanès, 84.

One effect of the Crusades, then, was to divert the warlike energies of the Nordics away from Western Europe to a distant object, namely, the menace of the Mohammedan and Mongol invasions, and while the Normans took up the gage with the cheerful "We are ready" of Josephus' Romans, the eight successive ventures occupied nearly two centuries and cost several million lives. The principal results were to increase the power of the Papacy, to whet the spirit of adventure and exploration, to enlarge the horizon of the mediæval peoples by contact and commerce with the East, to postpone the fall of Byzantium for 300 years, to destroy the power of the feudal aristocracy through the loss of their estates, and to fasten chivalry and knight-errantry upon Europe until the end of the fourteenth century. To the improvement of military science the Crusades contributed nothing whatever. Of the medical arrangements of these expeditions we know little, for like all feudal forces they were, at the start, undisciplined caravans; but that physicians were in attendance upon the leaders is evident from the narrative of Baldwin's wound, the first important casualty in the First Crusade. Sustaining a spear thrust in the thigh and the reins, with syncope from hæmorrhage, he was placed in a litter, "and thanks to the skill of the physicians and to his own strong constitution, was soon cured of a wound reputed mortal."²⁷ The miniatures in the MS. of *Lancelot du Lac* (Bibliothèque Nationale, Paris)²⁸ show that these litters, also described in the Old High German epics, were suspended between two horses, either tandem or abreast. The wounds incurred were either smashing blows on the skull from sword or battle-axes, incised wounds from slashing, or punctured wounds by spear or arrow, with great danger from external clotting and internal hemorrhage.²⁹ Fighting in the hot sun, in the heavy hauberk or chain armor of the Normans, produced many cases of heat-stroke. The characteristic long triangular shield of the Crusaders was sometimes employed as a litter, to bear the wounded to safe places. On the Fifth Crusade (1216-20) scurvy was first noted and described by Jacques de Vitry, and on the Seventh Crusade (1249-54) the same disease was noted by Joinville (1250). Dysentery, the pest, camp typhus and pernicious fevers exacted a heavy toll of lives on all the later Crusades. In spite of the religious motive of the

²⁷ Cabanès: *op. cit.*, 89.

²⁸ For reproduction, see Cabanès, p. 81.

²⁹ Punctured wounds from spears and arrows occasioned but little bleeding, whence fatalities from internal hemorrhage were common (Cabanès, p. 62). This was the rationale of cupping, leeching and wound-sucking in such cases, and wound-sucking was also associated with the idea of poisoning of wounds by weapons. If the brain, chest or abdomen were deeply pierced by a spear or arrow, the imbedded weapon could not be withdrawn without great laceration of friable tissues: the patient's chances, then, were either to bleed to death from internal hemorrhage or to die from the shock of sudden and violent withdrawal.

Crusades and the high character of many of the leaders, these expeditions were usually accompanied by great hordes of female camp followers, and the general effect of wandering soldiery was to relax morals everywhere. But as syphilis was in the nature of a mild endemic spirochætosis up to the end of the fifteenth century, we find no references to venereal disease in armies before that time.

One far-reaching result of the Crusades was the creation of a number of knightly orders, which, as they grew in wealth and power, were destined to exert great influence upon the subsequent hospital movement of the Middle Ages and upon the organization of religious nursing orders that went along with it. Of these, the Knights Templar was purely military, while the Hospitallers or Knights of St. John and the Teutonic Knights existed to defend the Holy City, to aid and protect pilgrims and to nurse the sick. When Godefroi de Bouillon captured Jerusalem on July 15, 1099, the Crusaders assumed possession of the great Hospital of St. John of Jerusalem, originally built by the merchants of Amalfi for the benefit of sick and indigent pilgrims. The order thus established, known as the Hospitallers of Jerusalem, became in time the Knights of St. John (1211), the Knights of Rhodes (1311), the Knights of Malta (1530), and while the establishment at Malta was broken up by Napoleon in 1798, the order still keeps up its traditions in England and Italy.³⁰ The order of The Teutonic Knights of St. Mary's Hospital at Jerusalem grew up around a hospital established there by the Germans in 1143 and around another erected at Acre by merchants of Bremen and Lübeck about 1190-91. This order had its headquarters at Acre for a century (1191-1291), but in 1309 it transferred its seat of government to Marienburg, where several fine hospitals and a *hôtel des invalides* were built. In 1229 the Teutonic Order began to establish strong fortresses all over Prussia, after the fashion of the Normans in England, and by the fourteenth century it had practically subjugated all of Prussia and Lithuania, which conquests it was destined to hand on to the Hohenzollerns (1525). The castles, hospitals and chapter-houses erected by the Teutonic Knights all over Eastern Prussia were, from a sanitary viewpoint, the finest structures of the Middle Ages, having subterranean heating plants and water-piping (or wells sunk on the premises), baths and wash-rooms, chimneys specially designed to carry off the thick vapors of torch-lighting, rooms arranged around a great central court, with arcades, and *Dansker-*

³⁰ For the early and subsequent history of this Order, see Rose G. Kingsley: *The Order of St. John of Jerusalem*, London, 1918 and Major A. C. Yate: *The Knights Hospitallers and Ambulance Work in War*. Jour. United Service Inst., London, 1900, xlv, 1099-1138

anlagen or tower-latrines, separated from the main building by lengthy galleries, with running water-courses underneath to remove excreta.³¹

Wound-Treatment in the Mediaeval Epics and Romances

In the *Germania* of Tacitus we get the first inkling of the part to be played by women in the care of the wounded during the Middle Ages:

The strongest incentive to courage lies in this, that neither chance nor casual grouping makes the squadron or the wedge,³² but family and kinship; close at hand, too, are the dearest, whence is heard the wailing voice of woman and the children's cry; here are the witnesses who are in each man's eye most precious; here the praise he covets most. They take their wounds to mother and wife, who do not shrink from counting the hurts and demanding a sight of them;³³ they minister to the combatants food and exhortation. Tradition relates that some lost or losing battles have been restored by the women, by the incessance of their prayers and the baring of their breasts; for so it is brought home to the men that the slavery, which they dread more keenly on their women's account, is close at hand. . . . Further, they conceive that in woman is a certain uncanny and prophetic sense; they neither scorn to consult them nor slight their answers (*Germania*, 8).

This note of the special fitness of women as nurses for the sick and wounded is constantly sounded in the mediæval epics and romances of chivalry. Care and treatment of the wounded became a particular function of great ladies.

From wandering "wise women" (*weise Frauen*) and "wild women" (*wilde Frauen*), who culled healing plants and practised herbal medicine, the German warriors are said to have acquired skill in wound-treatment. Thus, in the epic of *Gudrun* (1210), an old warrior's proficiency in medicine is described as such that his possible earnings could not be carried away on a camel's back:

Er war der Heilkunst kundig, man hat es längst vernommen,
Erlernt hat es der Recke von einem wilden Weibe, . . .
Da fand der Heilkunst Meister viel zu thun umher,
Sollt' er sich Gut verdienen im grossen Kriegesheer,
So könnten es Kameele nicht von der Stelle tragen.³⁴

Long before this time there are plenty of evidences of wound-treat-

³¹ Sudhoff: *Dresden Catalogue*, 1911, pp. 155 and 159 (items 5686-5698). Sudhoff also notes the superior sanitary arrangements of the Palazzo Davanzati in Florence (1300), recently restored. In point of architectural beauty, such mediaeval structures as the Musician's House at Reims, the house of Agnes Sorel at Orleans, or the Hôtel de Cluny (Paris), rose to great heights of perfection, but the sanitary arrangements were usually poor. Flinders Petrie observes that the Norman castle, "with its jealous corkscrew stairs," was conditioned by the fact that "almost any man was a possible assassin, and the greatest care was needed for safety against open or private attack on leaders" (*Some Sources of Human History*, London, 1919, p. 36).

³² *turma* (squadron), a cavalry formation; *cuneus* (wedge), an infantry formation.

³³ "Ad matres. ad conjuges vulnera ferunt: nec illae numerare aut exigere plagas pavent." *Exigere* has taxed the ingenuity of the commentators; some are tempted by the reading *exsugere*, which would imply wound-sucking.

³⁴ *Gudrun*, viii, 5, lines 526-534. Cited by Frölich: *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1880, iii, 229.

ment by barbarians, e. g., on a vase of the fourth century B. C., excavated at Koyl-Oba in the Crimea, which shows Scythian chieftains extracting a tooth and bandaging a wounded leg; or in the references in the Norse Eddas (*circa* 874 A. D.) to healing herbs, cauterization and other barbaric phases of wound-treatment. In the *Nibelungenlied* we read that the King of Burgundy and his brother looked after the transportation and care of their wounded vassals, placing them in comfortable beds; and that "skilled leeches, who healed the heroes after battle, were offered unweighed silver and bright gold."³⁵ In the later epics and romances, whether of Germany, France or England, women of high degree appear everywhere as nurses of the sick and healers of the wounded, the most celebrated being Queen Isolde of Ireland (of the Tristram legend), who figures in all the Arthurian romances. In the *Chansons de Gestes*, the *Parzifal* of Wolfram von Eschenbach (1204) or the *Mort d'Arthur* of Sir Thomas Malory (1485), it is either a hermit or the fair lady of some nearby castle who binds up the knight's wounds, when this service has not been rendered by one of his fellows; in the many accounts of battle-wounds in the *Chanson de Roland* there is only one reference to wound-dressing, viz., where Roland tears up his tunic to make a compressive bandage for the wounded Turpin. From the scattered details in these epics,³⁶ we get a composite picture of this phase of mediæval custom, which, with some exaggerations, is perhaps as close to fact as the homely details of English life in Crabbe or Wordsworth or Tennyson.

We see the wounded knight laid upon the ground, his wounds examined, washed and bandaged, often with a wimple (*Kopftuch*) from a woman's forehead;³⁷ the various practices of giving a stimulating wound-drink³⁸ to relieve faintness, of pouring oil or wine into wounds, of stanching hemorrhage or relieving pain by sundry herbs, of wound-sucking to prevent internal hemorrhage,³⁹ the mumbling of charms over wounds;⁴⁰ the many balsams, salves and plasters used in wound-dressing; the feeling of the pulse in the cephalic, median and hepatic veins to ascertain the patient's chances of recovery;⁴¹ the danger of suffocation or heat-stroke from the heavy visored helmet and coat of mail; the eventual transportation of the patient by hand, on shields or litters, on horseback or on litters attached to horses;⁴² the sumptuous

³⁵ Frölich, *op. cit.*, 229.

³⁶ For the French epics and romances, see Cabanès: *Chirurgiens et blessés à travers l'histoire*, Paris, 1918, 54-74. For the German, W. Haberling: *Die Verwundetensorge in den Heldenliedern des Mittelalters* (Jena. med.-hist. Beitr., 1917, Heft 10). For Malory's *Mort d'Arthur*, G. M. Gould and W. L. Pyle: *King Arthur's Medicine*. Johns Hopkins Hosp. Bull., Balt., 1897, vii, 239-246.

³⁷ Wolfram von Eschenbach: *Parzifal*, x, 141-142. Cited by Haberling.

³⁸ See A. Raubach: *Ueber die Wundtränke in der mittelalterlichen Chirurgie*. Berlin, 1898.

³⁹ e. g., *Parzifal*, x, 94-109.

⁴⁰ *Parzifal*, x, 143.

⁴¹ e. g. in the *Krone* (lines 6653-6671) of Heinrich von Türlin (1220), cited by Haberling, p. 19.

⁴² For methods of transportation, see Haberling. 36-39.

chambers and couches reserved for the high-born, and the calling in of physicians,⁴³ usually from the famous schools of Salerno or Montpellier, in grave cases. The ministrations of womankind are always depicted with great charm, and prelude the organization of sick nursing in the later mediæval period.

In the Chronicles of Froissart (1337–1410), the Herodotus of the Hundred Years' War (1336–1453), we can glean many details of the military medicine of the fourteenth century. The tales of instant death or of cleavage of the body or the skull by smashing, heavy-handed sword strokes are as frequent, and perhaps as exaggerated, as those in the *Chanson de Roland*; but in Froissart, the constantly recurring references to bringing the wounded to some house nearby (*au logis*) and to getting them into a comfortable condition by suitable dressings (*mettre à point les navrés et les blessés*) lead to the conclusion that this was common practice in the French army in the period.

Beyond these simple details, nothing whatever is related as to the further history of the wounded; only the Homeric alternative: death or recovery. There were apparently no professional surgeons attached to these fourteenth century armies. Evacuation and wound-dressing were performed by comrades; the wounded nobles were dressed by their pages and squires, and litters were sometimes ordered to convey them to safe places in nearby fortresses or cities. The old chronicler revels in lengthy details about the food supplies—the biscuit, salt meats, cereals, wines, beer (*cervoise*) and the beef, mutton and pork on the hoof. He tells of the poverty, penury and abstemious diet of the Scotch soldiers, of their worries lest any wounded be left behind; of the national concern of the English for creature comforts, their cooking stoves, handmills for grinding grain and lavish commissariat; of the traveling kitchens, bakeries and portable barracks of the French; the vinegar doled out as a ration in lieu of wine, as among the Romans; the boxes of salves, bandages and lint in the supply trains. Froissart's account of the camp at Chisay (Poitou) in 1372 may be compared with the Roman camp in Josephus. He describes at length an epidemic of jaundice (1378), a probable epidemic of typhus (1385), the epidemic of plague, of gastro-intestinal type, which caused the raising of the siege of Lisbon (1384), and a number of cases of heat-stroke (1391). Dysentery and malarial fever appear, from his descriptions, to have been the regular scourges of the French army at this time.⁴⁴

Further Progress in Military Medicine and Surgery

To England is due the credit of making the first attempt at an organized medical service in the Middle Ages, apart from the Byzantine Empire. Withington⁴⁵ accounts for this innovation as follows:

When Prince Edward was stabbed in Palestine, it is very doubtful whether the wound was sucked by his wife; but there is good evidence that it was excised by an English surgeon, and the success of the treatment perhaps inspired him with respect for the healing art, for we find him accompanied in the invasion of Scotland (1299–1301) by no less than seven medical men. They included a king's physician and two

⁴³ In the French literature of the period, the laic barbers or apothecaries are styled *mires*, the clerical physicians *médecins*.

⁴⁴ For a full account of military medicine in Froissart, giving all the citations, see the close study by médecin-major Henri Favrier in *France méd.*, Par., 1901, xlviii, 409; 452; 1902; xlix, 4; 19.

⁴⁵ E. T. Withington: *Medical History*, London, 1894, 223–224.

juniors (*valetti*), a king's surgeon and two assistants (*socii*), and a simple surgeon. The king's physician and surgeon each received a knight's pay—two shillings daily; and the others, who ranked as esquires, half that sum. That they found plenty to do is indicated by the fact that the chief surgeon got compensation for three horses killed in Scotland "on the king's service." But this germ of a medical staff seems to have undergone no further development,⁴⁶ for we hear nothing of military surgeons during the wars of Edward III, except that the Welshmen who fought at Crécy were accompanied by one of their own race. In the following century appear the often-quoted names of Nicholas Colnet, physician, and Thomas Morstede, surgeon, who went with Henry V to Agincourt. Both were attended by three mounted archers, and Morstede had, in addition, twelve members of his own craft as his assistants. Colnet and Morstede were to receive one shilling, and their attendants six pence per diem, together with a share of the plunder, and their part of "the usual bounty," viz., 100 marks (£66 13s. 4d.) per quarter for every thirty men during the actual campaign. If they got all this they were well paid indeed, but only one receipt has come down to us, in which Colnet acknowledges the payment of £8 6s. 8d. as half-quarter's salary for himself and his archers. Another surgeon, William Bredewardyn, seems to have been afterwards associated with Morstede, and they were allowed two waggon and a chariot for their baggage.

Military surgery was backward in mediæval France, England and Germany, for the reason that the general practice of surgery among the people was in the hands of barbers and bath-keepers, whose avocations were venesection, cupping, leeching, giving enemata and extracting teeth. About 1201, the Collège de St. Côme was founded in Paris by Jean Pitard who had accompanied Saint Louis (IX) to the Holy Land, and divided its membership into the clerical "surgeons of the long robe" and the lay-barbers or "surgeons of the short robe." It was not until 1372 that the latter were permitted to treat wounds. As time went on, both clerics and barbers were despised by the internists. In England, the master surgeons formed a separate guild in 1368, combined with the physicians about 1421, while the barbers obtained a separate charter in 1462. In Germany, barber-surgery was first pronounced "honorable" by Emperor Wenzel in 1406. The constant strife between these three guilds was not composed for centuries. Meanwhile the Middle Ages numbered some very eminent surgeons, notably Roger of Palermo, Hugh of Lucca, Bruno of Longoburg, and Theodoric, Bishop of Cervia, all of whom were pioneers of the dry or Hippocratic (aseptic) method of wound treatment, in which they were later sustained by Henri de Mondeville (1260-1320), a pupil of Lanfranc, and opposed by

⁴⁶ Most of the efforts at organization and administration were tentative and fitful, e. g., the rule of Adolf of Nassau that wounds should be bandaged in camp and not in the field (1298), or the privilege of "*un chirurgien pour leur curer leurs playes, blessures et navreures*" accorded to the police organization known as the *sergents du verge du Châtelet* at Paris in 1405. Frölich (*op. cit.*, 238-239) records the indiscriminate slaughtering of the helpless and wounded in the Swiss and German wars, e. g., at Sempach (1386) and Döfflingen (1388), and by the Turks at Nicopolis (1396). Mutilation of the wounded and of prisoners by Turks after a battle is the subject of an elaborate engraving in Gottfried's *Chronik* (1629).

Guy de Chauliac (1300–68), the most learned and versatile surgeon of his time. Saliceto (1210–77), who sutured nerves, recognized the venereal cause of chancre and described renal dropsy, had seen military service, as had Hugh of Lucca, John of Arderne (1306–90), who devised an admirable operation for anal fistula, and the Fleming, Jean Yperman (1295–1351), who made many innovations. The Bavarian army surgeon, Heinrich von Pfolspeundt, first mentions powder burns and describes the extraction of bullets by means of the sound (1460), while gunshot wounds are first described in detail by the two Alsatian military surgeons, Hieronymus Brunschwig (1497) and Hans von Gersdorff (1517). These treatises, however, belong to the literature of the German Renaissance.

Public and Military Hygiene in the Middle Ages

The Feudal System, with the intense individualism and fierce rivalries of its overlords, did not make for the spirit of coöperation and subordination to the common weal which are essential to good government, and as part of the biological process of upbuilding nations, the spirit of the times became more and more collectivistic. Of this historic phase Allbutt gives an illuminating exposition:⁴⁷

“If we inquire more closely how medicine fared in the fiery youth of modern Europe, we may offer at any rate two parts of the answer: first, the iron rule of prince and prelate, wicked as individual rulers have been, was possible because the peoples felt instinctively the radical and universal need of the age to be that the elements of the new Europe should be welded into a stable and coherent whole. This passionate idea of unity, called now the Church, now the Empire; here visible as the feudal tramp of the crusades, there as the tyrannous vociferations of the schools, would brook no schism, ecclesiastical, social or personal. As of every other sphere, so this spirit of domination took possession of Medicine, and therein set up the idolatry of Galen as inexorably as that of Aristotle in the sphere of philosophy. Whatever at one period were the constructive effects of this despotism, when it had outlasted its time it became as oppressive to Medicine, and to all knowledge, as formerly it had been socially integrative.

“Secondly—or indeed it is another aspect of these reflections—the soul of the Middle Ages was a collective soul; its great works were the offspring not of individuals but of peoples. Who built the minsters; who painted the windows and the Books of Hours; who wrote the liturgies and chansons, we know not. As the churches, the liturgies, the manuscripts, the poetry and drama were achievements not so much of persons as of congregations, so also mediæval learning was for the most part the learning of inspired crowds at the heels of a rhetorician.

“Thus all this mediæval achievement, fervid and beautiful as it was, could not do much for science; nor even for the intellectual harmonies of the fine arts. As the mediæval spirit was multiform and catholic, the Greek spirit on the contrary was choice and personal, and owed its being to individuals—to Ictinus and Mnesicles, Phidias and Polygnotus, Homer and Æschylus, Plato and Aristotle, Mantegna and

⁴⁷ Allbutt: *The Historical Relations of Medicine and Surgery*. London, 1905; Preface, pp. ix-xi.

Donatello. The Greek was an individualising and an emancipating spirit, the mediæval collective and enthralling—a genius of assemblies and associations of men.”

The most striking effect of collectivism was the development of public hygiene, in which the rulers, physicians and public officers of the Middle Ages did their best work. As in the first half of the nineteenth century, these developments were necessitated by the terrible ravages of epidemic diseases, notably the bubonic plague or Black Death (1348), otherwise known as the Great Mortality because it destroyed over one-fourth of the entire human race, leprosy, syphilis, influenza, St. Anthony's fire (erysipelas or ergotism), sweating sickness and Plica Polonica. These diseases were spread in epidemic proportions by wandering soldiery and outlaws and through the squalid, crowded condition of the population in the walled mediæval towns. In the 14th century some eight diseases, viz., plague, phthisis, epilepsy, scabies (syphilis), erysipelas, anthrax, trachoma, and leprosy, came to be regarded as contagious, and measures were taken to isolate carriers, to prevent them from entering cities, to prohibit them from selling food or beverages, or to drive them from communities. This doctrine of “eight diseases” originated with Rhazes in the 10th century, was stereotyped in a current Latin verse and was written into the public ordinances of towns. The leper was condemned to “civil death,” and from the time of Gregory of Tours (560), lazar-houses or leper hospitals increased in number until there were about 220 in England and Scotland and 2,000 in France alone. By this process and through the introduction of quarantine against plague by the Venetian Republic the two most formidable pandemics were eventually stamped out. Of the deep historic significance of these applications of the Biblical code of sanitation, Sudhoff writes as follows:⁴⁸

“Although Greek medicine became of incomparable importance in general human progress and bases its title to fame chiefly upon the substitution of the investigation of natural ætiology for the supernatural demonic medicine, which ruled the whole of pre-Hippocratic Orient and Occident (Mediterranean and North Alpine) and still enslaves part of the world, it is a most interesting fact that, despite its theory of natural causation, Greek medicine was blind to the fact of contagion, of the direct transmission of disease. Whence so glaring a defect in the face of such keen perception of the processes of nature? Thucydides' history of the Athenian plague shows that these facts had not entirely escaped the Greeks, but Greek medicine passed them by, perhaps, because a natural explanation seemed impossible, since the populace so readily satisfied itself with the “Evil Eye” and similar imaginations.

“Along the Euphrates, however, we come early upon the concept of a chronic, rarely curable disease, characterized by cutaneous changes and capable of transmission to others. Babylonian culture in fact readily drew the proper conclusion and translated knowledge into action: Those affected with this disease must be debarred from intercourse with the healthy. . . .

⁴⁸ Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 115-117.

“When leprosy fell upon the ancient world from the East, and came to the cognizance of Greek physicians, especially of Alexandria, these met its appearance with an admirable establishment of the semeiology, without penetrating deeper into epidemiological questions or recording any prophylactic measures of segregation. Egypt, where in Hellenic times leprosy spread and became established, was then its general sally port in the West and is, even today, one of its principal fields of activity. From Egypt, the disease in sluggish epidemic form traversed North Africa, crossed the strait of Gibraltar with the continuous stream of travelers, and spread over Moorish Spain; at the same time the germs were carried by the constant migrations across the Mediterranean to Italy and Southern France, across Byzantium to the Balkan and Danube states. The network became especially close over Southern Gaul, and even farther into Celtic domain, over which a Germanic stratum had been deposited; here, authentically in the sixth century, the thought of rending or cutting the threads of the epidemic which coursed over the lands was initially entertained. Enlightened princes of the church, moved by the increasing misery of the people, on the strength of the sacerdotal code of the Old Testament, undertook the task of interfering; the shepherdess of the mediæval peoples knew her duty. The Council of Lyons (583) attempted to restrict the free migration of lepers. The edict of Rotharus, King of the Lombards, demonstrates what advances this idea made in sixty years; the acts of Charlemagne, one and a half centuries later, show the same trend; the leprosy decretals of the third Lateran Council (1179) represent, in a measure, the last word of the church. Apprehension of lepers became general routine in the territories of the ecclesiastical and secular princes of France and Germany; isolation camps were established everywhere, gradually increasing to thousands. Thither the lepers and suspects were taken, the former civilly dead for the rest of life. This system was mercilessly enforced for centuries with perfect success. In this tenacious fight of centuries, the methods of which were borrowed from the Mosaic Code, the Occident triumphed over leprosy. Guided by this intellectual torch, it accomplished the first great feat in direct prophylaxis; methodical eradication of leprosy by consistently making the affected individuals harmless as carriers of the virus. Light from the East is transformed to pulsating energy by the European peoples, while the disease swings its lash unchecked in the Orient.

“The same light, rising for Occidental and Mohammedan physicians alike, spent its luminosity over a second great battle, which constitutes an additional title to fame for the Middle Ages: the campaign against an acute infectious disease, which, like the destroying angel, again coursed over the Mediterranean from the Orient, the plague. Stirred by the “Black Death,” which arose about the middle of the fourteenth century, the public officials of Italy and Southern France, during successive decades into the next century, with Venice and Marseilles as pioneers, created the whole system of sanitary control of incoming vessels, of observation stations, isolation hospitals and methods of disinfection. All this was adopted by modern hygiene, in more definite and rigorous form, with relatively few changes. An energetic attempt to establish order in the infected cities was made, without, however, the consistency and purposefulness of the prevention of importation. Three dates may be cited in this connection: 1374, Venice, being again threatened by importation of the plague, denied entry to the city of all infected or suspected ships, travelers and freight; 1377, Ragusa, in Dalmatia, rejected all travelers from plague districts, who had not sojourned for a month at one of two designated points, without developing the disease; 1383, Marseilles erected her first quarantine station, at which, after rigid inspection of the vessels, all travelers and cargoes from stricken or suspicious

ships were detained for forty days, exposed to air and sunshine. These are the principles of preventive medicine in the Middle Ages, created by physicians and authorities in common endeavor, in amplification of an idea called into being by the campaign against leprosy."

The various religious orders did much for sick nursing, the Benedictine monasteries were frequently provided with infirmaries, and the hospital movement initiated by Innocent III in 1198 led to the foundation of such institutions all over Europe. At first these hospitals were only retreats for the sick, infirm or indigent, but the necessity of treating syphilitics by inunction and sweating initiated the actual treatment of diseases in hospital, and there came to be hospitals for the curable (*curabiles, ergo curandi*) as well as the incurable, and isolation hospitals for communicable diseases.⁴⁹ The pamphlet literature of plague-tracts and of directions for the personal hygiene of the nobility, or of those undertaking long journeys and sea-voyages, was enormous. The following chronology of city ordinances and hygienic manifestos, most of them exhumed by Sudhoff, shows the trend of the mediæval period in public hygiene:

- 1204 Opening of the Santo Spirito Hospital at Rome.
- 1214 Appointment of city physician at Bologna at a fixed salary.
- 1224 Edict of Frederick II regulating the practice of medicine.
- 1231 Salerno constituted a medical school by Frederick II.
- 1231 Ordinance of Frederick II against pollution of the atmosphere, adulteration of food and drugs, sale of poisons and the watering of wine.
- 1302 First judicial post mortem (Bologna).
- 1316 City surgeon at Lübeck at 16 marks per annum.
- 1350 Ordinance of city of Basel specifying "eight diseases" as contagious.
- 1357 [and later] Forensic protocols on suspected lepers.
- 1374 Ordinance of Cologne confining slaughtering of animals to city abattoir.
- 1374 Ordinance of Reggio against plague.
- 1374 Venetian Republic excludes infected and suspected ships from pratique.
- 1377 Ragusa exacts 30 days quarantine.
- 1383 Marseilles exacts 40 days quarantine.
- 1388 Parliament of Cambridge on soil pollution as a cause of disease.
- 1388 Salaried city veterinarian at Ulm.
- 1403 Venetian Republic establishes time limits of quarantine (*quaranta giorni*).
- 1409 Insane asylum at Seville.
- 1427 Ordinance of Ulm against smoky chimneys.
- 1452 Ordinance of Ratisbon regulating midwifery.
- 1464 Quarantine station established at Pisa.
- 1464-75 Tucher's *Baumeisterbuch* (against heaps of manure, disposal of sewage in streets, and requiring lanterns on street corners).
- 1494 Sebastian Brant attacks adulteration of wine, sausages, sugar and saffron.
- 1495 Syphilis first mentioned in the Edict against Blasphemers of Maximilian I.

In the writings of Arnold of Villanova (1235-1312) is included a

⁴⁹ Pagel-Sudhoff: Einführung in die Geschichte der Medizin, 2. Aufl. Berlin, 1915, 188.

tract on the hygiene of troops in camp (*de regimine castra sequentium*) of date 1498:

Arnold recommends that an army should pitch its camp on level ground, away from swamps, facing east or west; that water should not be taken from springs containing slimy sticks of wood, nor from wells or cisterns containing slimy matter, nor from any part of a river in which beams of wood are immersed. To ascertain if well-water is impure, a thin, clean, piece of white linen should be dipped into it and later hung in the sunlight to dry; if spots of any color appear, such water is to be avoided. To prevent epidemics, a trench should be dug outside the camp to contain the cadavers and dejecta of animals, which is to be covered again with earth, when half full. The rest of Arnold's tract is made up of mediæval prescriptions and recipes, for which reason von Töply believes it should be attributed to some other author.⁵⁰

Introduction of Camp Hospitals and Ambulances

In mediæval Spain military medicine was further advanced than is commonly supposed. Physicians and surgeons accompanied the Spanish armies on campaigns, and in Moorish Spain, in the thirteenth century, there were hospitals of the Arabic pattern, in which the patients were distributed according to sex and kinds of diseases, with convalescent wards, attendants and courses of medical lectures. In the chronicles of the conquest of Granada and the expulsion of the Moors by the armies of Ferdinand and Isabella we find definite evidence of the establishment of camp hospitals and ambulance service by the Queen. Six large hospital tents were in use at the siege of Alora (1484) and four at the siege of Baza (1489). Wagons provided with beds are said to have been used at the siege of Otrera (1477-8), and on the day following the capture of Malaga (August 19, 1487), some 400 of these entered the city. Through the courtesy of Drs. Edward T. Withington (Oxford) and Charles Singer (London), it is possible to give the original citations bearing upon Queen Isabella's ambulances and hospitals:⁵¹

1. From the account of the siege of Alora (1484) by Hernando del Pulgar:⁵²

É para curar los feridos é los dolientes, la Reyna embiaba siempre á los reales seis tiendas grandes, é las camas de ropa necesarios para los feridos y enfermos; y embiaba fisicos é cirujanos é medicinas é hombres que los serviesen, é mandaba que no llevasen precio alguno, porque ella lo mandaba pagar. Y estas tiendas con todo este aparejo se llamadan en los reales el hospital de la Reyna.

For the care of the sick and wounded, the queen sent always to the camp six large tents and their furniture, together with physicians, surgeons, medicines and attendants; and commanded that they should charge nothing, for she would pay for all. In the camps, these tents with their appointments were called the Queen's Hospital.

⁵⁰ R. von Töply: Die Lagerhygiene des Arnold von Villanova. Militärarzt, Wien, 1896, xxx, 97; 113; 133; 149.

⁵¹ The references and translations were first given by Dr. Withington in his Medical History, London, 1894, 224-225.

⁵² Hernando del Pulgar: Cronica de los Reyes Catolicos (III, 33), Valencia, 1770, 230. Also given in condensed form in Prescott's Ferdinand and Isabella, London, 1858, I, 366.

2. From an oration held before the Pope in the Consistory at Rome by the Valentian, Pedro Bosca (November 11, 1487):⁵³

Sequuntur item exercitum religiosissimum, ne illi quicquid deesse possit, quadrigenti ferme⁵⁴ currus, operti umbraculis quod hospitale reginae appellant; in quibus impensa regia et sumptu amplissimo, quicquid curandis egrotis, sive ex acie vulneratis arte medica vel cyrurgica necessarium esse potest invenitur; honestissimis et probatissimis matronis huic muneri servientibus ad ministrantibus. Nulla scorta, nulli lenones, nulla periuria, nulli denique sortium ludi in exercitu admittuntur, ne cuique pessime aut perperam agendi occasio dari valeat.

That nothing might be lacking, the most devout army was followed by about 400 ambulances, covered with awnings, which (train) was called the Queen's Hospital; in these, at the Queen's expense and in lavish outlay, was found everything necessary to the art of medicine and of surgery for the treatment of the sick or the wounded from the ranks; those attending and ministering to this duty being matrons of the most honest and trustworthy character; no prostitutes, no panderers, no perjury, no games of chance were permitted in the army, lest anyone might find opportunity to behave dishonorably or improperly.

3. From the letter of Peter Martyr to the Archbishop of Milan on the siege of Baza (1489):

Hospitalia post haec tentoria quatuor-ingentia, providum Reginae pietatis inventum, est operae pretium videre, ad remedium haec et medelam non sauciorum modo, sed quovis morbo laborantium erecta. Medicorum, pharmacopolarum, chirurgorumque et reliquorum ad ministeria addictorum, is est numerus, is est ordo, ea diligentia rerum ea copia, ut neque suburbano vestro Sancto Spiritu, neque vasto illi tuo Mediolanensium cedant hospitalibus. Regia impensa quicquid languoris, quicquid accidentis emergit, ni status cuique a natura dies assit absconditur.⁵⁵

Four huge hospital tents, the careful provision of queenly piety, are a sight worth seeing. They are intended not only for the wounded, but for those laboring under any disease. The physicians, apothecaries, surgeons and other attendants are as numerous, the order, diligence, and supply of all things needful as complete as in your Suburban Infirmary of the Holy Spirit or your great Milan Hospital itself. Every sickness and casualty is met and provided for by the royal bounty, except where Nature's appointed day is at hand.

Queen Isabella herself visited the wounded in the field, and when some of her grandees hinted that this was contrary to Castilian etiquette, she replied:

"Let me alone. These poor people have here no other mother to lighten their sufferings. Believe me, the only consolation our neglected subjects have is the

⁵³ Pedro Bosca: Oratio Romae habita xi Kal. Novembris ad Sacrum Cardinalium Senatum Apostolicum in celebritate victoriae Malachitanae (etc.) Rome, 1487.

⁵⁴ *Ferme*, from *fere*, nearly, almost, is wrongly translated by the Spanish historians *fortalecidos*, i. e., strongly fastened.

⁵⁵ Peter Martyr: Opus Epistolarum (No. 73), Amsterdam, 1670, 39.

presence of their sovereigns, and if these cannot give their health back to them, they may at least inspire them with the courage to bear their troublesome diseases and painful wounds with patience."

The admiring chronicler, Dr. Withington writes, concludes as follows: "Surely this queen deserved as much as those ancient Greek and Roman princesses the title *mater castrorum*."

The fall of Constantinople in the East and the end of the Hundred Years' War in the West both happened in the same year (1453), and with this date the mediæval period really closes. Queen Isabella's ambulances were harbingers of the more generous and expansive spirit of the Renaissance.

CHAPTER V

The Renaissance Period

In one of his addresses, President Lowell of Harvard observed:

“It is hardly an exaggeration to summarize the history of four hundred years by saying that the leading idea of a conquering nation in relation to the conquered was in 1600 to change their religion; in 1700 to change their trade; in 1800 to change their laws, and in 1900 to change their drainage.”

Even before 1600, and indeed following the Reformation (1517–34), most of the wars of the 16th century were religious wars. The most dramatic events of the period, the *autos-de-fé* (1482–1800), the Peasants' War (1524–5), the execution of Sir Thomas More (1535), the burning of Servetus (1553), St. Bartholomew's (1572), the execution of the Queen of Scots (1586), the Armada (1588) were all occasioned by the theological hatred which moved the religious of whatever persuasion to persecute and torment the heretics of their respective creeds. Antagonisms of creeds brought on such lengthy wars as those against the Huguenots (1562–1609), the Revolt of the Netherlands (1572–1609), the Thirty Years War (1618–48), and the wars waged by Louis XIV against Holland and Germany (1672–97). During the 15th and 16th centuries the art of war was profoundly modified by the introduction of firearms and artillery, which widened the distance between the fighting lines, gradually did away with *armes blanches* and revolutionized the practice of military surgery. At Crécy (1346), Poitiers (1356) and Agincourt (1415), the yeoman-archers of England had demonstrated their superiority over the feudal cavalry, while wandering knight-errantry had long before received its final crushing defeat at Mansurah (1250), the last battle of the Crusades. The straggling caravans of chivalry were replaced by well-drilled bodies of mercenary heavy infantry, marching to drum and fife, such as the *condottieri* of Italy, the *Landesknechte* of Germany and Switzerland or the Swiss Guards (*Suisses*) hired by France, Spain and the Papal See. From these organizations, with their regimental system, was gradually evolved the modern concept of national armies. The fierce hatred everywhere engendered against lawless, swaggering mercenaries and military adventurers, e.g., in England after the Wars of the Roses (1455–85), forms the leading motive of Machiavelli's *Art of War* (1521).¹ Readers of Charles Reade's "Cloister and the

¹ Capt. C. P. Atkinson: *Encycl. Britan.*, Cambridge, 1910, II, 597–599.

Hearth" and similar books will recall how unsafe it was in this period to cross any part of continental Europe without arms or bodyguard. Yet this was the age which witnessed the Renaissance or Revival of Learning, and the Renascence or new-birth of Western civilization, in which the invention of printing (1448), the dispersal of the Greek scholars over Europe after the fall of Constantinople (1453) and of the German printers after the sack of Mainz by Adolph of Nassau (1462) were factors of moment. In art and science, the period was one of extraordinary brilliancy, as witness such great figures as Leonardo da Vinci (1452-1519), Michael Angelo (1475-1564), Albert Dürer (1471-1528), Shakespeare (1564-1616), Copernicus (1473-1543), Paracelsus (1493-1541), Vesalius (1514-64), and Paré (1510-90). The publication of a large body of scientific writings in the vernacular marks a distinct break with the past and Paracelsus was the first to discard the practice of lecturing on medicine in Latin. The grand achievement of Renaissance medicine was the revival of scientific anatomy by Leonardo da Vinci (1512) and Vesalius (1543), which was followed by a host of anatomical discoveries, all of physiological import, and led to the rehabilitation of operative surgery by Paré and of experimental physiology by Harvey.

While military surgery became a new thing in the hands of Paré, military medicine continued to lag behind and for the following reasons. Before the advent of Paré, educated surgeons, attached as of old to the persons of powerful nobles, did nothing whatever for the common soldier, and the few surgeons of lower caste, employed as a business insurance for the mercenary troops and required by them, were usually men of small education who acted as barbers for the officers. But as the mercenary organizations gradually merged into the standing armies of Charles VII (1448) and Maximilian I, the number of medical personnel for the rank and file was increased and better medical administration was thereby secured. Toward the end of the 14th century, over and above such evacuation of the wounded by comrades as we read of in Froissart, it had become customary to hire a number of barber-surgeons to treat the wounds of ordinary soldiery. Thus, while we find such able physicians as Colnet and Morestede with Henry V at Agincourt (1415), Gersdorff with the Swiss Confederates at Grandson and Murten (1476), Gabriel Miron with Charles VII at Naples (1494), Marcello Cumano with the Milanese at Novara (1513), Symphorien Champier with Francis I at Marignano (1515) and Louis Desbournes at Pavia (1525), there begin to appear, in the city archives of the Swiss cantons and elsewhere, evidences of the authorized employment of barber surgeons to treat the wounded at public cost.

State Care of the Wounded by the Swiss Confederation

In his carefully documented study of the care of the wounded in the wars of the Swiss Confederation (1315–1798),² Dr. Conrad Brunner has demonstrated a fact hitherto unknown to historians, namely that Switzerland antedated all other nations of modern Europe in state care of the wounded, i.e., in actual municipal ordinances notifying the individual soldier that his government was behind him in respect of his welfare on the field of battle.

When the cantons of Uri, Schwyz and Unterwalden concluded their pact of eternal federation (1291), there began a long series of bloody wars with outland enemies and of fierce internecine struggles between rival groups of cantons which resulted in the ultimate autonomy of the Helvetian Republic. At Morgarten (1315), Laupen (1339), Sempach (1386), Naefels (1388), Grandson (1476), Murten (1476), Nancy (1476), Giornico (1478), Dornach (1499), Novara (1513) and the first day at Marignano (1515), the valorous Swiss were able to demonstrate repeatedly that whatever huge force confronted their small detachments was, like Bret Harte's grizzly, only a "coward of heroic size," and so well-earned and well-established is their reputation as sturdy, invincible fighters that their European neighbors have seen fit to leave them unmolested to date.

Brunner's researches show that, from the date of the battle of Laupen (1339) onward, the accounts in the Swiss archives are replete with disbursements of moneys for the care of the wounded and their dependents. In the earlier period, these consisted of payments to various barber-surgeons for attending the wounded after battle, e. g., those made by the city of Berne after the Gugler War (1376), the siege of Burgdorf (1383) and the Zürich Wars (1436–50) or by St. Gall after the siege of Rheinegg (1405). This gradually became custom in all the cantons. In the archives of the Zürich Wars, we find the council of Lucerne authorizing that the wounded should continue to receive their pay as long as the troops remained in the field (1444). During the Müllhausen War, an order goes forth from Berne that Marcellin the barber shall accompany a well-equipped force of 130 men (June 15, 1467). During the Burgundian campaign, (1474–77), a similar ordinance is issued by Basel, detailing two barber-surgeons to accompany the troops, with provisions for continuing the pay of the wounded for the period of the war (March 30, 1474). In an order of the day following the battle of Grandson (1476), it is promulgated that all living expenses of the wounded and all costs for medical attendance shall be paid "in moderation" out of the common purse (May 15, 1476), with a subsequent protocol of account, showing expenditure of 300 guilders for 200 wounded or 1½ guilders *per capita*. After Grandson, the council of Lucerne further decreed that the property of children orphaned by the war should be carefully guarded by the state, with restitution in case of embezzlement by officials; that the state should pay not only for treatment of the indigent wounded up to recovery, but should also pay for the maintenance of themselves and family until they were able to resume work. This is also verified by the city accounts of 1476. After the battle of Dornach (September 2, 1499), the Bernese devoted all the booty, a sum of 800 pounds, to the maintenance of the wounded and of the widows and orphans of the slain. The account-books of both Berne and Solothurn for 1499–1500 show that these items continued to be paid out of the city funds. In the Italian campaign of 1500–29, the cost of caring for the Swiss wounded was borne by the Duchy of Milan, e. g., 4 guilders *per capita* after the taking of Pavia (1512). After the battle of Kappel (1531), the city-accounts of Zürich for 1531–32, show a disbursement of 1358 pounds for care of the

² C. Brunner: *Die Verwundeten in den Kriegen der alten Eidgenossenschaft*, Tübingen, 1903.

wounded, bandaging material, tips to surgeons' apprentices, moneys advanced to the wounded themselves, and expenses of sending convalescents to mineral baths, while expenses of wagon transportation amounted to 16 pounds or more. The non-transportable wounded were treated at public cost in an improvised hospital in the cloister at Oetenbach. After the peace between Berne and the five Catholic cantons (1533) sick and wounded war prisoners were allowed to return to their homes without ransom, upon payment of living expenses and cost of medical attention. In the so-called period of "capitulations" (1531-1600), in which the cantons hired out their troops to France, Spain and the Papal See, the financial obligation of caring for the sick and wounded is expressly stipulated in the tightly drawn contracts between the separate cantons and these neighboring states.³ In the muster-rolls of detachments ordered to field duty by the different cantons during 1371 to 1584 the names of the barber-surgeons and physicians detailed are always given. In a muster-roll of Basel (1542), the title "field-barber" (*Feldscher*) appears for the first time, and chief field-barber (*Oberster Feldscher*) in a Bernese roster of 1589. On account of the fierce spirit of the times all medical personnel bore arms and before 1589 the field-apothecaries were not even listed among the medical personnel but participated as combatants. As judged from the municipal account books, the fees accorded the barbers for field services and care of wounded after battles were handsome allowances for the times.⁴ When the Swiss began to hire out their men-at-arms as mercenaries, they proved hard bargainers for their employers, whence the proverb, *Point d'argent, point de Suisse*. Contrary to French and German practice, no attempt was made to collect or relieve the wounded until after a battle. The so-called Sempach Pact (1393), concluded between nine cantons, specifies that the wounded should not attempt to escape during a battle, but were to remain standfast within the lines until the end of the action, lest they incur the penalty of desertion. Fighting in these early days was desperate and bloody, both the prisoners and wounded were commonly massacred, and no quarter was shown the enemy on either side. The Swiss Confederates were required to take a barbaric oath to spare none of the enemy and to permit none of their own men to be captured. This was customary until the beginning of the 16th century when return of prisoners and wounded was permitted. But once accepted, this humane principle was lived up to with characteristic fidelity and reliability, and it is significant that the Red Cross idea was eventually established by a Swiss, Henri Dunant. During the recent European war the peoples of the different Swiss cantons voluntarily displayed the most magnanimous charity toward the war prisoners and refugees within their frontiers, paying for their maintenance out of their own pockets, even to their own impoverishment, an object lesson in practical internationalism to all nations of the civilized world.

Reforms of Maximilian I and Later Developments

The origins of standing national armies are commonly traced to the changes in military organization initiated by Charles VII of France and Maximilian I of Germany. To put a stop to the brutal plundering of the people by wandering mercenary soldiery, Charles VII (1422-61) instituted *compagnies d'ordonnance*, i.e., troops solely under the orders and authority of the king, and not likely to change sides at the instance

³ For example, in the contract made by the cantons of Wallis and Graubünden with Leo X (1514); "Ist abgeredt das bābstliche Heligkeit denselben (i.e., the wounded) so lang sy in siner Heligkeit dienst vnd vff der widerfahrt sind, Iren soll bezalen vnd sy nit minder noch anders dann die wollmöglichen solle halten." In the contract with Spain (1544), wagon transportation of the wounded is stipulated. Brunner, *op. cit.*, 57.

⁴ See, for examples, Brunner, *op. cit.*, 52-54.

of the highest bidder or to raid unprotected territory, in free-lance fashion, to suit the caprices of their reckless managing directors. These companies had an average strength of 600 men each, but no regular medical personnel. After the battle of Bosworth Field (1485) the example was followed by Henry VII of England, in his "yeomen of the guard," a small band of 50 archers.⁵ In like manner, Maximilian I (1459-1519) recruited his standing army of *Landesknechte* (native-born soldiers) from the people, principally as a weapon of offence against the menace of Turkish invasion. These were heavy foot-soldiers, armed with musketry as well as halberds, bows and arrows. This organization of *Landesknechte*, further developed by Charles V (1519-56), was principally fostered by Georg von Frundsberg (1473-1528), whose concern for the sanitary welfare of the soldier was highly praised by his contemporaries. Its administration is described at length in the treatise on Imperial Courts-Martial of Leonhard Fronsperger (1555),⁶ whose instructions to medical personnel were regarded by Frölich as the basis of the medical regulations of the modern German army.⁷ In this organization each aggregation (*Hauffen*) of 5,000-10,000 men was divided into regiments, consisting of 10-14 or more "standards" (*Fähnlein*) or troops of 400 men each. To each troop, each company of infantry (200 men), and each squadron of cavalry was assigned a barber-surgeon (*Feldscher*) at a double salary of 4 guilders monthly. The commander of each *Hauffen* had attached to his staff a field physician-in-chief (*Obrist-Feld-artzet*) and a field-barber (*Doktor und Feldscher*). The field marshal of cavalry had a physician (*Doktor der Artzeney*) and the Chief of Artillery a surgeon (*Wundartzet*), at a monthly salary of 30 guilders, with an assistant barber (*Scheerer*). The field-barber ranked between a clerk and a halberdier or between a quartermaster sergeant and a corporal.

Fronsperger's regulations concerning the physician-in-chief and the field-barbers have been translated by Heizmann⁸ as follows:

The physician-in-chief must have been a doctor, or one who had recently charge of surgeons or field-barbers by state authority; he must be a well-known, skillful, experienced and cautious man, of the proper age, upon whom all barbers, sutlers, wounded, sick and stricken could rely for help and counsel in time of need, particularly when they are shot, cut, bruised or broken, or are suffering from any accidental or disabling diseases, such as scalds, fluxes, fevers, and similar affections that occur among soldiers. His duties are even more extensive in that he should inspect, both when the regiment is organized and later at monthly muster, the instruments and everything pertaining thereto, and when he

⁵ A. A. Gore: *The Story of our Services under the Crown*, London, 1879, 35.

⁶ L. Fronsperger: *Vom Keyserlichen Kriegsgerechten, Malefitz und Schuldhändler, Ordnung und Regiment*, Frankfurt am Main, 1555.

⁷ Frölich: *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1880, III, 256.

⁸ C. L. Heizmann: *Ann. Med. History*, N. Y., 1917-18, I, 283.

finds anything lacking or lost, such shall be charged to the field-barber, to make up the deficit. When this cannot be done, he shall find other means to meet emergencies. On the march he will closely attend his commanding officer. When exigency or peril impends from the enemy, in battle array or skirmishes and such like, he shall remain in the neighborhood of his superior military officer; but he will also oversee as much as possible the other physicians, surgeons and the like, wherever wounded, etc., are to be attended, and he shall devote his care, advice and skill to all others, particularly because he, above others, is ready with instruments, apothecaries and medicines for both internal and external wounds and sickness.

He should also with all diligence advise whether a leg, arm or such should be amputated or preserved by other means. Further, he should give his attention to the severely wounded, that they may not be left too long on the lines or in the companies, but immediately carried to the surgeons and aided by beneficial dressings. On the march, when it becomes important to have a field-barber near at hand or available, it is his business to see that one is stationed between the cavalry and infantry, with his instruments. On other occasions, in camp and quarters, each barber remains with the troop in which he has been assigned for duty. Whenever a question arises between barbers and cured soldiers or others as to the payment to be made, he shall settle it, seeing that neither too much nor too little is given.

As it is necessary that a field-barber or surgeon serve with each troop, so should each Captain be careful to select a well-versed, skilful, experienced and trained man, and not a poor beard-shaver or bath-boy as often happens by reason of favor; thus, the killing or maiming of good soldiers may be prevented. The field-barber should be supplied with all necessary medicines and instruments in a field wagon, and the Captain should see that it is done. He should be a capable *Knecht* to help in necessity. His duty is to render assistance first, when there is need, to those of his own troop, not to exact too much from anyone, but to treat men at reasonable and like rates. He shall have his lodging at night at the company pennant so that he may be found in necessity, and it is best that one barber should be accessible to each lodging house, on account of the sick and wounded. He shall serve with his troop in all else like an ordinary soldier, and he shall receive double pay.

Here we have a spirit of organization and a sense of discipline which shows considerable advance even upon Roman or Byzantine standards. In the armies of Charles V the sick and wounded were sent to the baggage train and put under tents (the field hospitals of his grandmother Isabella), where they were attended by physicians or barbers and nursed by the innumerable female camp-followers, who, as we shall see, lived with the soldiers as actual or putative wives, and with their children, performed the most menial duties. On breaking camp wagon transportation was employed for the light sick and slightly wounded, while more desperate cases were sent to hospitals in the nearest towns. A *Spitalmeister* or hospital-superintendent, selected and paid by the *Landesknechte* in common, was delegated to look after the sick in hospital or on the march, and to furnish supplies. When the army moved forward couriers were despatched ahead to locate suitable quarters, including a house for the barber-surgeons and their patients. In battle the medical personnel were located with the rear-guard, with orders to

bring the wounded out of the lines to a safe place and bandage them. In the field the sick or wounded continued to receive their pay.⁹

In France the armies of Charles the Bold, Duke of Burgundy (1433–77) had a surgeon attached to every company of 100 lancers, i.e., one surgeon to every 800 men, over and above the physicians attached to the Duke and his vassals. The lancers received twelve crowns monthly, the physicians five. The court of Charles had attached to it 6 physicians, 4 surgeons and 40 assistants, and it is said that even this personnel, large for the times, was not adequate to look after the wounds incurred in battle, jousting at tournaments and knightly exercises. Charles is highly praised for his fatherly care for the sick and wounded by the European historians. At the end of the century, as we shall see, stationary military hospitals, with ambulance service for first aid, were established by Sully (1597), in the reign of Henri IV, and were so well managed that even high officers were content to be treated in them.¹⁰

When Edward IV of England (1461–83) joined the army of Charles the Bold in his campaign against Louis XI (1475), he had with his forces a chief physician, 2 body physicians, a surgeon and 13 assistant barber-surgeons. Prior to this time the field surgeons Colnet and Morstede, who accompanied Henry V to France (1415), with 15 assistants, were indentured to the King, with later authority to “press” surgeons and instrument-makers into the military service. Annuities were sometimes granted to the severely wounded in this period, and by the time of Henry VIII (1509–47) a definite system of pay for soldiers and army surgeons was established, although the medical personnel, as described by Gale, was poor in quality. At the battle of St. Quentin (1557) the English Army had a regular medical staff consisting of 2 surgeons attached to the general, and one each to the lieutenant general, the high marshal, the general of horsemen, the captain general of footmen, and the master of ordnance, as in Fronsperger’s arrangement of 1555. There were in all 57 of these surgeons at a salary of 1 shilling per diem for infantry service and 2s. for cavalry. In the army mobilized to repel the Armada (1588), this had been raised to 1s. 6d. daily, being sometimes supplemented by a stoppage out of the soldier’s pay of 2d. monthly, the origin of “hospital funds.”¹¹

In Italy the different city-republics—Florence, Venice, Naples, Ferrara, Verona—had, from the 13th century on, a small surgical personnel attached to their armies, usually 2 surgeons at a salary of 40 soldi daily, while 40 galleys of the Genoese Navy had one barber and

⁹ Heizmann: *op. cit.*, 282.

¹⁰ Brunner: *op. cit.*, 11–15.

¹¹ A. A. Gore: *op. cit.*, 32–41. Brunner, 15–17.

an assistant barber for their complement of 210 men each (1337). Italian military surgeons of higher caste were later prominent as authorities on gunshot wounds.¹²

In Spain the tradition of ambulance and field hospital service, established by Isabella, appears to have been kept up, and the infantry regiments (*tercios de infanteria*) of the armies of Charles V had each a physician and a surgeon at monthly salaries of 15 and 12 escudos respectively. Toward the end of the 16th century a stationary military hospital was erected at Pamplona by Captain General Gonzaga Colona. The Invincible Armada (1588) had a hospital-ship, but its history was swallowed up in the destruction of that fleet.¹³

The Siege of Metz

As a sidelight on military sanitation in the period, Heizmann has rightly signalized the defense of Metz (October 20—December 26, 1552) as the high-water mark of medico-military administration in the 16th century.¹⁴

He points out that in the 16th century the proportion of sieges to battles was 2:1, due to the new element of heavy artillery, which forced troops to seek shelter within the ramparts of towns. Of 57 besieged towns Heizmann notes that "24 were carried by assault, 20 capitulated and 13 were relieved or abandoned." In other words, famine and disease had as much to do with results as military science. Although the lessons learned by the mediaeval peoples about Mosaic hygiene, the doctrine of "eight" communicable diseases and the isolation of possible carriers had not been forgotten, the memoirs of the time teem with recitals of great suffering and high mortality from dirt, disease and neglect. Why? The only answer is perhaps that "man is an animal who is fain to lie in the unclean straw of his intellectual habits." Medico-military administration, as a definitive purposeful mechanism to force commands and individual units to keep themselves and their surroundings clean, was almost non-existent and its perfection had to wait upon the advent of Pasteur, Koch and Lister, from whom came the newer concept that sanitation is personal or community asepsis.

Prior to the siege of Metz, the armies of France, which had captured Toul, Metz, and Verdun, had become deplorably weakened by famine, due to the fact that the troops were outnumbered by their camp followers, who loaded the supply wagons with useless plunder, while reckless drinking of suspicious water caused "great diseases, pleurisies and fevers." Confronting the besieged town was the army of Charles V, consisting of 14 regiments (143 companies) of *Landesknechte*, with the rudimentary medical establishment described by Fronsperger, and an additional force of 120,000 Spanish and Italian companies, cavalry and pioneers, with 140 pieces of artillery. Opposing this gigantic army, twice the size of any other for more than a hundred years, the Duke of Guise had within the walls of Metz only 12 companies of infantry (4,600 men), 444 horse and 920 gendarmes. Yet so ably was the defense of the town conducted that in 65 days the besieging armies began their retreat on December 26, 1552. Guise had made the most elaborate preparations by purchasing animals, storing provisions, razing superfluous structures, expelling useless

¹² Brunner: *op. cit.*, 17-18.

¹³ Brunner: *op. cit.*, 19-21.

¹⁴ Heizmann: *op. cit.*, 281-287.

persons, classifying all others according to industrial capacity and devising effective sanitary measures. Soldiers sick with communicable diseases were isolated at once; the wounded or sick were taken immediately to hospital; barber surgeons were provided with money to obtain matériel for wound-treatment; pioneers were ordered to remove all filth and carrion and to keep the streets always clean. The supply list, as given by Paré, was lavish and rations were carefully doled out toward the end of the siege. Paré himself was the leading spirit of the medical personnel and through his big humanity the wounded soldier for the first time in history received attention from the body-physicians of nobles. Prisoners of war were treated with great consideration and, indeed, brought epidemic typhus into Metz after the raising of the siege. The besieging armies suffered enormously from the bitter cold, lack of food and clothing, frostbite, dysentery, scurvy and typhus fever, losing in all some 20,000 men. The retreat was hurried and in such bad order that the dead were left unburied and many of the sick and wounded were abandoned. These were collected and sent to hospital by Guise, while Alba was notified by a trumpeter that a safe conduct and water transportation would be granted to those conducting disabled prisoners to Thionville.

"The defense of Metz," says Heizmann, "became the marvel of Europe; it, without doubt, saved France from destruction, and, in many ways, besides political, its effects were lasting. Wounded soldiers were afterwards better treated, as at the siege of Thionville, 1558, and after the capture of Havre, 1563, when the project of an *Invalides* originated with the Queen Mother, though it was not carried out for many years. The humanity of Guise towards both well and sick was remembered at the siege of Therouanne, 1553, by the Spanish, who, on being reminded of it by the French, courteously saved all prisoners, says Brantôme. After this the custom of massacring prisoners who were not reserved for ransom, gradually declined, and this was the germ from which arose the spirit that culminated, in a little over 300 years, in the articles of the Geneva Convention."

Battle Losses up to the 17th Century

As Frölich observes,¹⁵ reliable figures of battle losses in the Middle Ages are scarce, doubtless for the reason that, in the unsettled condition of times, few counts were taken and few people were competent to handle statistics. The losses among the Northern barbarians were probably tremendous. When Aetius defeated Attila in 451, the latter lost 160,000—300,000 out of a horde of 700,000. According to Procopius the wars between the Ostrogoths and Byzantines occasioned the destruction of over 15 million men. At Fontenay (841) 100,000 Franks were killed. The Hungarians, defeated by Henry I at Merseburg in 933, lost 80,000. The Crusades occasioned the destruction of three million (two million Europeans) in 194 years. When Rudolf of Hapsburg defeated the Bohemian King Ottokar in 1278 some 14,000 were slain. At the battle of the Spurs (1302) 1,200 French knights were killed. At Crécy (1346) the losses were 2,500 nobles, 4,000 horsemen and 30,000 soldiers.¹⁶ The Mongol invaders, from Gengis Khan (1214) to Tamerlane (1369–1405), devastated vast regions and destroyed whole cities and their populations, sweeping from Manchuria to Liegnitz (Silesia) in 1235–41. During the contests among the mediaeval Italian cities there were a number of droll battles with no casualties whatever, due to the protective efficiency of heavy plate armor. Cortez in Mexico lost only 50 out of his 400 men during 1519–20, but some 4,300 out of 8,000 on his march to the coast (1520); he destroyed 200,000 city Mexicans in 1521. During the Peasants' War (1523–25) 16,000 were killed in Thuringia alone, and 7,500 at Frankenhäusen (1525). At the massacre of St. Bartholomew (August 24, 1572) 30,000 people

¹⁵ Frölich: *Ztschr. f. Krankenpflege*, Berl., 1896, XVIII, 45.

¹⁶ Frölich: *Ibid.*, 66–67.

were slaughtered. At St. Jakob de Birs (1444) 1,300 of the 1,500 Swiss Confederates were killed and 200 wounded, while the Armagnacs lost 2,200 killed and 400 wounded. At Grandson (1476) 1,000 Burgundians were destroyed; the Swiss mortality is not known, but the records show 400 wounded. At Murten (1476) 14,000 Burgundians were killed, while the Swiss lost 500 and many wounded. At Frastenz (1499) 3,000 Swabians were killed and 1,300 drowned; the Swiss records show only 12 killed and 60 wounded, which is a strain upon our credulity. In the Italian campaign of 1500-29 1,500 Swiss were killed and 1,500 wounded at Novara (1513) out of an army of 5,000, while 8,000 of the enemy were slain; at Marignano (1515) the Swiss army of 24,000 lost 6-7,000 killed, and 1,500 wounded, the French about the same number. At Pavia (1524) the Swiss lost 6,000.¹⁷

Epidemic Diseases

In the 16th century small-pox, measles, typhus fever, yellow-fever, diphtheria, whooping cough, influenza, lead poisoning and ergotism, began to make their appearance in epidemic form, for the first time, as records go, and of these typhus fever, small pox and the various modes of influenza were the principal scourges of camps. Small pox, measles and scurvy were mainly rampant in the Germanic and Scandinavian countries. Yellow fever was confined to the West Indies. Typhus fever broke out among the Spanish troops after the siege of Granada (1489), where it was called *tabardiglo* (the red coat). It became epidemic in Italy in 1505 and 1524-30 and was first described by Fracastorius (1530), and in Mexico by Francesco Bravo (1570). The so-called Hungarian disease (*morbus Hungaricus*), which spread all over Europe in 1501 and 1505, was probably typhus fever, and was a formidable menace of armies. The so-called epidemic of syphilis at the "siege" of Naples (1495) has been shown by Sudhoff to have been, in reality, typhoid fever. Diphtheria, described by Schedel in 1492, was six times epidemic in Spain (1581-1600) where it was described by native writers as *garrotillo*, and reached Italy in 1618. Whooping cough was first described by Guillaume Baillou in 1578. The various forms of ergotism were some of them modes of influenza, and Crookshank has shown that the variety known as *Kriebelkrankheit* was, in all probability, encephalitis lethargica.

*Prostitution and Syphilis in Armies*¹⁸

In the armies of ancient times promiscuous sexual relations with attractive female harp and flute-players and slaves were common and commonplace. As reflected in Homer, Athenaeus, Lucian, Plautus (*Miles Gloriosus*) and other writers of antiquity, the attitude of the Greeks, Romans and Asiatic peoples toward such matters was that of later continental Europe, which needs no further qualification or discussion here. In the *Anabasis* (IV, 3; VI, 1) Xenophon refers to the horde of *hetairae* who accompanied the Ten Thousand on their retreat after the battle of Cunaxa (401), and the concern which the troops displayed for their safety. Philip of Macedon, however, exhibited no such tolerance and his example was followed by his son, Alexander the Great, up to his entry into Babylon, when his system of restraint broke down, and his own end was the consequence of reckless and imbecile dissipa-

¹⁷ Brunner: *op. cit.*, 73-74.

¹⁸ For an exhaustive account of this matter, see W. Haberling: *Das Dirnenwesen in den Heeren und seine Bekämpfung*, Ztschr. f. Bekämpf. d. Geschlechtskr., Leipz., 1914, XV, 63; 103; 143; 169; 312; 323.

tion. In the Roman armies women were not tolerated in the camps before the time of Septimius Severus (193–211 A.D.), who permitted the soldiers to live with housekeepers (*focariae*).¹⁹ Soldiers were not permitted to marry while on military duty, but for this very reason the entry of soldiers into distant towns, or into Rome after a campaign, was followed by general relaxation of morals; and as Mommsen shrewdly observes, this laxity was tolerated and winked at by the Roman authorities as relieving the army of the expense of caring for children and other incidents of the married state. In the 4th century the newer privilege of a wife or housekeeper and children was continued, as recorded in the Theodosian Codex (VII, 3, 6), but they were not permitted in camp, except as a special privilege (VII, 1, 3). During the Middle Ages the Crusades and other military expeditions were usually followed by great swarms of women, in spite of regulations to the contrary, and military orders cutting down the number were made solely for economic reasons, viz., to limit the number of mouths to feed in camp. In the mercenary armies of the 15th and 16th centuries, the late Roman practice of tolerating *focariae* was revived among the *Landesknechte*. These female camp-followers (*Marketenderinnen*) lived with the troops, bore them children, did nimble shilling business in doling out wine, and functioned generally as cooks, housekeepers, sempstresses and nurses for the sick and wounded. On the march these poor women were veritable beasts of burden, carrying on their backs all the soldier's luggage, as well as his illegitimate infants. Blows and curses were their portion; if not constantly employed in collecting firewood and other chores, and they were frequently fought for and exchanged like slaves. As depicted in the prologue to Schiller's *Wallenstein*, the attitude of the wandering *Landesknechte* toward these women was one of broad, humorous toleration. All this was to take on a different aspect through the introduction of a new factor, viz., the advent of syphilis. Where syphilis came from, no one knows. The most rational solution of its mysterious apparition in the Middle Ages is that of Professor Sudhoff.²⁰ There was no demonstrable syphilis in prehistoric times, nor in antiquity, and it is not mentioned by Dante, Chaucer or Boccaccio, all keen observers of the life around them. But Sydenham, with remarkable insight, pronounced European syphilis to be a modified West African yaws, and Sudhoff believes that it existed in Europe in the form of a mild endemic spirochaetosis as early as the 12th century, if not before. This view is not unreasonable, since the spirochaetae, of whatever kind,

¹⁹ *Focariae*, literally, guardians of the hearth or fire-makers.

²⁰ See Sudhoff: *Graphische und typographische Erstlinge der Syphilis*, Leipzig, 1912; *Aus der Frühgeschichte der Syphilis*, Leipzig, 1912; *Mal franoso in Italien*, Giessen, 1912; and his summary of the whole matter in *Bull. Med. History Soc.*, Chicago, 1917, II, 15; 24.

are, in all probability, parasites of tropical provenance, and the Arabian physicians, in Asia and Africa, were the first to use mercurial ointment for a mysterious group of cutaneous eruptions which were confused with scabies and leprosy. As the successful exhibition of quinine diagnoses most varieties of malarial infection, so the cleaning up of these eruptions by mercury points to lues venerea. This inunction treatment became common practice among the Salernitan and later surgeons long before the alleged importation of syphilis by Columbus' sailors in 1493. Probably before 1275,²¹ Saliceto had declared chancre to be due to *coitus cum meretrice*, and even recommended a prophylactic vinegar solution (*ablutio cum aqua frigida et roratio loci cum aceto*). To the outcast barber surgeons of the 12th-14th centuries, who were the natural physicians and familiars of the prostitutes of the time, the disease was variously known as *scabies grossa*, *variola grossa*, *grosse vérole*, *gros mal* and *mal franzoso*. In 1463 a courtesan of Dijon testified in court that she had kept off an unwelcome suitor by stating that she was sick with the *gros mal*. The alleged outbreak of syphilis among the troops at the siege of Naples (1495) is held by Sudhoff to have been an epidemic of typhoid or paratyphoid infection, and two months before these troops got away from Novara on October 10, 1495, syphilis was spreading in Germany (as shown by Emperor Maximilian's Edict of August 7), and had been already noted by Trithemius and Brunschwig in 1493. While the account book of the syphilis hospital at Augsburg during 1497-1852, investigated by Sudhoff, shows that the disease never really attained epidemic proportions, there is no doubt that wandering *soldatesca* furnished a large quota of carriers. The important thing is that the prostitute as a carrier was recognized by the surgeon Saliceto before 1275, and in a French court of justice in 1463. As in the mediæval ritual against leprosy, the unfortunate syphilitics were driven from the towns, to spread the disease elsewhere, until hospitals were created for them. The effects of the disease after 1495 were particularly malignant and loathsome, as in the syphilis of the South Seas or the "Black Lion" of the Peninsular War, yet in the many military orders restricting the number of prostitutes in camp,²² there is no mention of the possibility of infection before the proposition of John of Nassau in 1608.²³

²¹ The *Cirurgia* of Saliceto, first printed at Piacenza in 1476, was begun in 1269 and completed June 7-8, 1275 (Sudhoff).

²² For example those of Francis I (1514), Charles IX (1570) and Henry III (1579) in France, Albert the Pious in Belgium (1580), Maximilian II (1570) and the German Articles of War of 1524. Haberling, *op. cit.*, 169-173.

²³ Haberling: *op. cit.*, 173-174.

Military Surgery in the 16th Century

War surgery in the 16th century underwent many changes through the necessity of dealing with gunshot wounds.²⁴ Gunpowder was described by Roger Bacon (1214-92) about the middle of the 13th century; canon were manufactured at Ghent a hundred years later, were perhaps in use at the battle of Bannockburn, (1314) and were certainly employed at Crécy (1346). At the siege of Harfleur (1415) there was a regular service of ordnance, and in later military operations, such as the Hussite wars or the siege of Constantinople, the artillery played an effective part. Small fire-arms were at first so heavy and clumsy that they had to be mounted. The arquebus derived its characteristic bend and trigger from the cross-bow, acquired a wheel-lock in 1515, and through the substitution of a flint-lock for a matchlock (1671) was transformed into a musket.

The first mention of gunshot wounds is to be found in the treatise on military surgery of Heinrich von Pfolzpeundt (1460), one of the Teutonic Knights. He treats mainly of arrow wounds, but describes the removal of powder from gunshot wounds by irrigation with human milk and the removal of bullets by means of the sound:

With the sound you must lift out the little load or bullet which was propelled into the body by the musket, and whatever else was discharged into the wound:

Marcello Cumano, in his *Vademecum*, says a few words about the painful character of these wounds. The next authority, in order of time, is the "Book of Surgery" of the Alsatian army surgeon, Hieronymus Brunschwig (1497).

Brunschwig regarded gunshot wounds as poisoned, advises removal of the poisonous powder by the seesaw motions of a silken seton through the sinus and extraction of the bullet with the forceps, after enlargement of the wound by incision or by the "wound-dilator." He believed in the promotion of suppuration (laudable pus) by insertion of bacon fat, as an aid in loosening the arrow or bullet before extraction.

Hans von Gersdorff in his "Field Book of Wound Surgery (1517)" did not regard gunshot wounds as poisoned.

He treated them by rinsing with warm hemp-seed oil, to get rid of the powder, extraction of the bullet by various instruments, with a final dressing of "Egyptian ointment," compounded of honey, vinegar, verdigris and alum. Gersdorff performed amputation by Esmarching the limb with a constricting band, checking haemorrhage by styptic

²⁴ For exhaustive accounts of the treatment of gunshot wounds in the 16th century, see: Th. Billroth: *Historische Studien über die Beurtheilung und Behandlung der Schusswunden*, Berlin, 1859; E. Gurlt: *Geschichte der Chirurgie*, Berlin, 1898, II, *passim*; Sir. T. C. Allbutt: *The Historical Relations of Medicine and Surgery*, London, 1905, *passim*; V. Fossel: *Mitt. der Ver. d. Aerzte in Steiermark*, Graz 1904, XLI, 161-173; N. Senn: *Surg. Gynec. & Obst.*, Chicago, 1907, V, 613-622; C. Singer: *Quart. Rev.*, Lond., 1916 (No. 447), 452-469; and Reinhold Winter: *Ueber die Verwundungen durch Feuerwaffen und die diesbezüglichen Leistungen der Chirurgie im 15. und 16. Jahrhundert*, Breslau dissertation, 1917.

or cautery and enclosing the stump in a bull's (or hog's) bladder. Gangrene was the only indication for the operation in these times. Pfolspeundt, Brunschwig, and Gersdorff employed the mediaeval substitute for anaesthesia, viz., inhalation of an infusion of opium, mandrake root, henbane, lettuce and hemlock from a "sleeping sponge." Gersdorff claims to have performed one or two hundred amputations without giving any opium internally. He treated ankylosed joints by forcible extension with an apparatus called *Narr* (fool). Both Brunschwig and Gersdorff abound in striking illustrations of the surgical practice of the time, e. g., the cauterization of a wound, the first picture of amputation, extraction of an arrow near a battlefield, decompression of the skull by a special elevator, leprosy, St. Anthony's fire, etc.

The view that gunshot wounds were poisoned burns was further upheld by the Italian surgeons Vigo and Ferri.

Giovanni da Vigo (1460–1520) physician to Julius II, deals with the subject in his surgical treatise of 1514. He regards gunshot wounds as contused, scorched, or poisoned, and recommends treatment with boiling oil or the actual cautery, a survival of the barbaric savage practice of branding which was recommended in a spurious Hippocratic aphorism and grafted upon European practice by the Arabian physicians. Alfonso Ferri (1515–95), who published the earliest work exclusively devoted to gunshot wounds (1552), is more moderate in his views. He observed that bits of clothing or armor driven into the wound may cause suppuration, advises probing for such objects, extraction of the bullet by a special forceps, haemostasis by underpinning the cut vessel, and evacuation of pus wherever found. If a lodged bullet gave no pain or other trouble, he believed in leaving it alone.

In the meantime, the Swiss medical reformer, Paracelsus (1491–1541), had published his "Larger Wound-Surgery" (1536) in which he filed a vigorous brief for simple, expectant treatment of wounds and general "let well enough alone" in the matter of the use of greasy salves, plasters, boiling oil, hot irons and other abominations.

"Warily must the surgeon take heed not to remove or interfere with Nature's balsam but protect and defend it in its working and virtue. It is in the nature of flesh to possess, in itself, an innate balsam which healeth wounds. Every limb has its own healing in itself; Nature has her own doctors in every limb; wherefore every surgeon should know that it is not he, but Nature, that heals. What do wounds need? Nothing. Inasmuch as the flesh grows from within outwards, and not from without inwards, so the surgery of a wound is a mere defensive, to prevent Nature from suffering any accident from without, so that she may proceed unchecked in her operations."

This reasoning, the essence of true Hippocratic (or aseptic) surgery and the intuition of a man of genius, goes to show that the contention about the purification of gunshot wounds by the cautery and boiling oil was only one phase of a larger problem, which was now to be approached by the greatest military surgeon of the time, Ambroïse Paré. Paré came up to Paris in 1532–3, an unlettered barber-surgeon's apprentice, and after three years experience as interne (*compagnon chirurgien*) at the Hôtel-Dieu, divided all the rest of his long life between military surgery in the French armies and private practice in Paris.

Like John Hunter he was lucky in that he had no scholastic training to interfere with the straightforward surety of his natural perceptions, while his hospital experience in dissecting, post-mortem work and practical surgery was of the best. When Paré began to make his reputation as a skilful surgical craftsman, Arabian doctrine, which divorced surgery from medicine and substituted the cautery for the knife, was bitterly upheld by the clerical bigots of the Paris Faculty (*les chirurgiens de longue robe*), and although Hippocrates, Hugh of Lucca, Theodoric of Cervia and Henri de Mondeville had taught the dry or aseptic wound treatment, it had been opposed by the learned Guy de Chauliac and all the surgeons after him, with the exception of Paracelsus, and eventually of Felix Würtz. Early in his army career, while surgeon to Colonel General de Montejan, on the expedition of Francis I to Turin (1536-7), Paré had a lesson in wound treatment that was destined to make history. Hear his own story:

"Now I was at this time a fresh-water soldier; I had not yet seen wounds made by gunshot at the first dressing. It is true I had read in John de Vigo first Book, *Of Wounds in General*, eighth chapter, that wounds made by firearms partake of venenosity by reason of the powder; and for their cure he bids you cauterise them with oil of elders scalding hot mixed with a little treacle. And to make no mistake, before I would use the said oil, knowing this was to bring great pain to the patient, I asked first before I applied it, what the other surgeons did for the first dressing; which was to put the said oil, boiling well, into the wounds, with tents and setons; wherefore I took courage to do as they did. At last my oil ran short and I was forced instead thereof to apply a digestive made of the yolks of eggs, oil of roses, and turpentine. In the night I could not sleep in quiet, fearing some default in not cauterising, that I should find the wounded to whom I had not used the said oil dead from the poison of their wounds; which made me rise very early to visit them, where beyond my expectation I found that those to whom I had applied my digestive medicament had but little pain, and their wounds without inflammation or swelling, having rested fairly well that night; the others, to whom the boiling oil was used, I found feverish, with great pain and swelling about the edges of their wounds. Then I resolved never more to burn thus cruelly poor men with gunshot wounds.

"While I was at Turin I found a surgeon famed above all others for his treatment of gunshot wounds; into whose favor I found means to insinuate myself, to have the recipe of his balm, as he called it, wherewith he dressed gunshot wounds. And he made me pay my court to him for two years, before I could possibly draw the recipe from him. In the end, thanks to my gifts and presents, he gave it to me; which was to boil in oil of lilies, young whelps just born and earth-worms prepared with Venetian turpentine. Then I was joyful and my heart made glad, that I had understood his remedy, which was like that which I had obtained by chance.

"See how I learned to treat gunshot wounds; not by books."²⁵

While much fun has been poked at this oil-of-puppy dressing, and Paré never attained to the clear surgical vision of Hugh, Theodoric, and

²⁵ From: "The Journey to Turin in 1536" in Paré's *Apologia et Voyages*; translated by Stephen Paget in his *Ambroïse Paré*, New York, 1897, 33-35; and by F. R. Packard in his "Life and Times of Ambroïse Paré," New York, 1921, 162-164.

Henri, the important thing is, as Allbutt says that "from this time the receptive mind of Paré perceived venom and burn were figments both and that a gunshot wound was just a contusion or comminution like another."²⁶ The most frequent response in his litany: "I dressed him; God healed him," and his straightforward utterances elsewhere reveal the forward trend of his independent thought toward the experimental or Hunterian ideal:

"We should not fall asleep over the labor of the ancients, as if they knew or said everything."

"You will have to render account not to the ancients but to God for your humanity and skill."

Again, Paré's application of the ligature of blood vessels to amputations was only part of his earnest desire to become a "*parfait practisour*" and to get away from the barbarous Arabian practice of cauterizing bleeding wounds to stanch hemorrhage. There was nothing new in the ligature. It was known to Celsus²⁷ and Archigenes as a commonplace procedure in wound surgery, as well as to Roger, Roland and Yperman. Paré himself wrongly attributes it to Galen, and his own method was not a true but an indirect ligation, the *ligature en masse*, including some of the tissues around the vessel and occasioning pain and inconvenience to the patient. But "until the time of Paré, the surgeons, for very intelligible reasons, shirked the larger amputations" (Allbutt).²⁸ His work was forward-looking and forward-moving, and his standard was already planted in the new territory.

The example of Paré was followed by the Italian surgeon Bartholommeo Maggi (1516-52), whose treatise on gunshot wounds was published in the year of his death (1552) and contemporaneously with that of Ferri. He held that gunshot wounds are neither scorched nor poisoned, made experiments to ascertain the heat of firing in a projectile, substituted a milder method of promoting suppuration for Vigo's drastic treatment, which he condemned, and recommended the earliest possible removal of the bullet. Leonardo Botallo (1530), physician to Charles IX of France, in his treatise on gunshot wounds (1560) opposed the practice of Vigo and Ferri, regarded such lesions as contused wounds, which were too zealously explored, sounded, dilated and enlarged. He condemned reckless dilation and in extraction, used curved sounds and shortened forceps. He preferred escharotics and the cautery for haemostasis, however, and was a veritable vampire of venesection, a pitiless bloodletter in all chronic diseases.

High in the annals of Renaissance surgery and well-beloved of medical men is the name of the Swiss army surgeon, Felix Würtz (1518-75), a follower of Paracelsus in simple wound treatment. He was only

²⁶ Allbutt: *op. cit.*, 83.

²⁷ "But if these remedies are also ineffectual in restraining the haemorrhage the bleeding vessels are to be taken up, and two ligatures to be applied, one on each side of the wound, and then (the vessels) are to be divided between the ligatures, that they may both unite together, by anastomosing branches and effect an obliteration of their orifices. Celsus: *De re medica*, V, 26 §21, Cited by Allbutt.

²⁸ Allbutt: *op. cit.*, 82.

a wound-surgeon, had no book-learning, wrote in the vernacular, and never essayed the major operations. He stood for laudable pus and the belief in suppuration as a cleanser of wounds, but none wrote with more fiery eloquence in aid of clean hands and against the meddlesome probes, plasters, salves, poultices, tents, setons and general fingering of open wounds. In the surgical treatise of Würtz (1563) is a little pediatric tract, easily the best of the time, which is the first brief for infantile surgery and orthopedics. When he lifts his voice against the deformation of infants by tight swaddling and rough handling, we sense the larger humanity of the Renaissance. "His heart beats so high that the thumping against his leathern coat is audible across the centuries."²⁹

The great Provençal surgeon Pierre Franco (1503–), driven into Switzerland by the Waldensian massacres, was, like Paré and Würtz, a self-educated barber, and was thus, as Allbutt says, "spared the misfortune of a speculative intellect." He was a bolder and better operator than Paré, and by his improvements in the technique of herniotomy, lithotomy, eye surgery and plastic surgery, took these procedures out of the hands of the strolling incisors and added new territory to the domain of legitimate surgery. He had been slightly treated by Haeser and Gurlt, but the right judgment is that of Malgaigne—"ce beau génie chirurgicale" and of Nicaise: "no surgeon made such discoveries as Franco; for hernia, stone and cataract he did more than Paré."

It remains to give some brief account of the great pathbreakers of Renaissance medicine, three shaggy, assertive figures to whom our profession owes much of the social position and intellectual liberty it now possesses.

Paracelsus

Aureolus Paracelsus (1493–1541), of Einsiedeln, Switzerland, a student of Leonicens at Ferrara (1515), began his lectures at Basel in 1527 by throwing the works of Galen and Avicenna into a bonfire. Of the astrological medicine of his time, he said: "I will throw your horoscopic prognostications into Lake Pilatus." He was the essential reformer of Renaissance medicine, aptly styled *Luther medicorum*. He was rough of speech, coarse in invective, obscure in thought and expression, but with such rapid flashes of insight as only true genius has, and popular as no other physician before him—the people's physician *par excellence*.

Paracelsus was the founder of chemotherapy, taught that medicine and surgery are one (*einerley*), stood for rational wound-treatment,³⁰ opposed witchcraft, starcraft and

²⁹ R. W. Emerson.

³⁰ For the wound-surgery of Paracelsus, see; Wolzendorff: *Deutsche Ztschr. f. prakt. Med.*, Leipz., 1876, III, 46; 58.

uromancy, was the first to analyze mineral waters and made real additions to the pharmacopoeia. He was the first to write on miners' diseases, described miner's phthisis and the effects of choke damp, saw gout and stone as diathetic diseases, and noted the correlation between goitre and myxoedema. His motto was: Experimentation controlled by the authoritative literature"³¹—a truly modern note.

Vesalius

Andreas Vesalius (1514–64), born in Brussels, sometime a military surgeon in the armies of Charles V, was the founder of modern anatomy, which he first taught locally by public dissection, demonstrating to all and sundry such knowledge of the structure of the human body as had never been seen before; and then *urbi et orbe*, in his epoch-making treatise, the *Fabrica* (1543), with illustrations only bettered in their time by the unapproachable drawings of Leonardo da Vinci. This book obliterated the older Galenic anatomy of apes and swine and was imitated and improved upon for centuries. In the copy of the *Fabrica* in the New York Academy of Medicine, Dr. Osler wrote: "The greatest book ever printed, from which modern medicine dates." Vesalius did the only physiological experiments between Galen and Harvey, was a pioneer in craniology and comparative psychology, and an admirable clinician and pathologist. While on duty with Charles V he was the first to describe aneurism of the thoracic and abdominal aorta (1555),³² the most important landmark in the history of the condition between Galen and Paré.

Ambroïse Paré (1510–90)

He was born in the little village of Bourg Hersent (Maine) and lived to the age of 80, his lifetime covering the better part of his century, from Flodden Field to the Armada, from Luther at Worms to the battle of Ivry. He lived through the reigns of seven French monarchs and of three Holy Roman Emperors (Maximilian, Charles V, and Philip II). Through this long life he managed to remain honest, firm, upright, humane and essentially sweet-tempered to the end, steering clear, as an impersonal physician and soldier,³³ from the intrigues of courts and the fanatical hatreds of religious sects. Although probably a Huguenot, his life was saved by the king at St. Bartholomew, and four months before his death we find him pleading successfully with the Archbishop of Lyon for the welfare of the besieged people of Paris. He invented many surgical instruments, introduced artificial limbs and eyes, the

³¹ "Experimenta ac ratio auctorum loco mihi suffragantur." Cited by Sudhoff.

³² For an account of which, see: A. N. Tasker: *Mil. Surgeon*, Wash., 1922, L. 338-342.

³³ That Paré was treated as the equivalent of an officer in campaign is evident from the manner in which he was consulted by monarchs and commanders in regard to military operations, e.g., at the defense of Hesdin (1553).

truss and implantation of the teeth, reintroduced massage and podalic version, described pyæmia, the effects of prostatic hypertrophy and fracture of the neck of the femur; saw flies as possible carriers of wound-infection and was the first to suggest the syphilitic origin of aneurism. But these are only details that went to the making of a great all-round surgeon. His collective works, the apple of his eye, are a curious mixture of sound sense and surgical genius with a specious parade of scholarship which may be charged up to the mysterious *pion* who probably embellished his writings for him.³⁴ For this Paré was persecuted by a bigot of the Paris Faculty, who wanted to stop the publication of his book, but serene in the support and countenance of the king, he flaps his adversary with bladders as *mon petit maistre* and, with the urbanity of his race, admonishes him to "quit his animosities and treat more kindly *le bon vieillard*." This phrase goes to the very heart of the matter. Paré is the greatest of military surgeons, just as Larrey and Letterman are in a manner the greatest of medical officers, through his ability, his large humanity and insight. Read his *Apologia et Voyages* and you will see for the first time in military history a medical vassal of great captains going out of his way to succor the ordinary wounded soldier, as at Perpignan (1543) or Boulogne (1545) or on the march through Germany (1552). Early in his career, at Turin (1536), Paré had seen an old sergeant cut the throats of three helpless wounded men, "gently and without malice," to put them out of misery. The episode appears to have affected him as profoundly as the boiling oil and red hot irons applied to wounds. The age in which he lived was one in which extravagant generosity touched hands with incredible meanness and jocund brutality. Courts assemble to view the *autos-de-fé*. High-born ladies laughingly inspect the corpses after St. Bartholomew for a reason not mentionable to ears polite. The brave Servetus is tortured to death in flaming fire for a quibble about theological verbiage, while the crowd looks on in sheep-like docility and gives no sign. The type is that of Hewlett's Bothwell leaning over the ship's taffrail and bawling at the perishing sailors: "Sooner you than me, you drowning swine!" In the bloody period in which he lived, a period in which people were less sensitive about murder and adultery than about differences

³⁴ No reflection is cast upon Paré in this assertion. In the period following the Revival of Learning, allusions to the Greek and Roman writers were as much in everybody's mouth as our small talk about classical music after symphony concerts, and Paré's actual knowledge of ancient medicine was, in his long life, as real and effective as Shakespeare's or Beethoven's knowledge of Plutarch's Lives. But it was the fashion of his time to stuff medical treatises with a footless show of erudition and he followed the line of least resistance. The apparent swagger in his writings is the expansive self assertion of the Renaissance people, which we find alike in Luther, Knox, Vesalius, Paracelsus, Brantôme, the Elizabethan dramatists and even Montaigne.

in religious beliefs, the sane, humane figure of Paré towers above his time and environment like some great seamark in an ocean storm.

In the words of Streeter:

“Quiet sessions with Paré leave us with the inevitable conviction that the ultimate ground for the safety and permanence of our human world lies in character—the character of plain, brave men like Paré. Our rogueries, frauds, cozens and delays cannot cover the fact that the central glory of the universe is character. Now, may we ask, what is the rôle of character in the art and mystery of medicine? What it has always been—that which redeems from decay.”

CHAPTER VI

The Seventeenth Century

Through the 16th and 17th centuries the spirit of individualism gained complete ascendancy and collectivism went into decline. The 17th century was an age of extraordinary activity in science, literature and art, while practice of medicine, hospital management, and organized care of the sick and wounded sank to a very low level. The centric achievement of 17th century medicine was the demonstration of the circulation of the blood by William Harvey in 1616 and his publication of the same in 1628. This great event, the starting point of modern experimental physiology, was accompanied by an impressive array of anatomical discoveries, each of physiological significance and led to the solution of the main elements in the problem of the physiology of respiration by a number of English chemists. Descartes outlined the theory of reflex action. The principles of the physiology of vision were elucidated by astronomers and mathematicians. The only work in the physiology of digestion before the time of Beaumont was accomplished by Peyer, Brunner and de Graaf (pancreatic and biliary fistulæ). In the hands of Kircher, Hooke, Leeuwenhoek and Malpighi, the microscope became a powerful aid to medical science. The foundations of medical jurisprudence and of vital statistics were well and truly laid and internal medicine, while generally backward, was eventually associated with such great names as Sydenham, Willis and Franciscus Sylvius. Many new diseases were described. The relation between typhus fever and pediculosis was noted in army camps by Tobias Cober in 1606. Some of the greatest medical men of this century, such as Harvey, Descartes, Willis, Sydenham, Wiseman and Purmann, served in armies. In 1633 Stephen Bradwell published the first book on first aid in sudden accidents.¹ Some 30 books on contagious diseases in armies were published, the most notable being the *Medicina Militaris* (1620) by Raimund Minderer (of spiritus Mindereri).

The wars of the period were the religious wars already mentioned, the English Parliamentary Wars and the struggle between the Dutch and

¹ S. Bradwell: *Helps for Suddain Accidents endangering Life*. London, 1633. It treats of poisoning, including that from mushrooms and shellfish, venomous bites and stings, falls from high places strangling, drowning, suffocation, choking, scalding, burns, and foreign bodies in the throat or gastro intestinal tract, including snakes and worms. The directions are quaint but practical. A similar tract of 23 chapters, prepared by Daniel Ludwig (1625-80) at the instance of Duke Ernst I of Saxe-Gotha, and published in 1685, is described by Töply as an inferior production. (*Militärarzt*, Wien, 1886, XX, 209-211.)

the English on the seas for the control of commerce, in particular of the drug trade.

This lucrative phase of maritime activity was a natural outcome of contact with the East through the Crusades and its origins are intimately connected with the facts set forth in Mr. Wells' chapter: "Land Ways give place to Sea Ways." In the Middle Ages the Eastern drug trade was in the hands of the Venetian Republic, which already controlled the Mediterranean transport service during the Crusades. When Vasco de Gama doubled the Cape in 1498, the Portuguese gained their opportunity and Lisbon became the central mart for drugs and spices during the 16th century. After 1596 the Dutch, who controlled the maritime freight service between Northern and Southern Europe, gained the jealously guarded secret of the sea-route to the East, through the publication of Linschoten's travels, and once they had worsted the Portuguese in naval warfare, resorted to every device to monopolize the clove and nutmeg. As Motley observed, the world's destiny seemed to hang upon "the growth of a particular gillyflower." The clash between the Dutch and the English began about 1622-23, but the English had already gained a decisive foothold in the Indies through the chartering of the British East India Company on December 31, 1600.

The military medicine of the period shows no great advance over that of the 16th century due to the rigid divorce between medicine and surgery started by Galen, maintained by the Arabians, standardized by the ecclesiastical interdictions of the Middle Ages, and now become codified custom. The bitter rivalries between physicians, surgeons and barbers continued, and while the physician had the best of it, styling himself a *medicus purus*, he was usually as Molière has represented him, a sterile pedant and coxcomb. In England internal medicine was nothing to speak of before the time of Sydenham (1624-89). As always happens in an age in which scientific medicine is ardently followed by the elect, the folk-medicine of the period became more ludicrous and contemptible than that of primitive man. The therapeutic devices of the 17th century reveal a distinct backward trend in internal medicine. The pharmacopœias of the time were very aptly styled "filth-pharmacopœias," as being made up of the most nauseating and loathsome ingredients, usually compounded from the parts of different animals. Writers on military medicine are singularly reticent as to the contents of the vaunted field medical chests of the period, some of which contained no less than 284 remedies, including oils of vipers and angle-worms, beetles, ear-wigs, powdered mummy, etc.² Mme. de

² A field-chest devised by Muralt for the Bavarian artillery in the Turkish campaign of 1688 is described by J. Schuster (Deutsche mil.-ärztl. Ztschr., Berl., 1916, XLV, 123-131). It weighed 320 pounds and contained 30 surgical instruments and matériel, with 197 remedies, including 3 pounds of theriac (an opiate antidote of 64 ingredients), mithridate (49 ingredients), tincture of bezoar, Pannonian powder (mostly red sandal-wood), *pulvis ad casum* (i. e., for any emergency, containing rhubarb, *terra sigillata*, palm-juice, spermaceti and mummy dust), scorpion oil, rainworm oil, zinc oxide, Vigo's plaster of frog-spawn and mercury, human fat, dog's fat, rhubarb, jalap, aloes, senna, tartar emetic, Peruvian bark, mercurials, sugar of lead, alum, guaiac, sassafras, squills, cantharides, hartshorn, sal ammoniac, camphor, opium, etc.

Sevigné was enthusiastic about urine as a remedy. Sir Kenelm Digby's "sympathetic powder" for healing wounds at a distance, and the "weapon-salve" applied to the weapon instead of the wound, were employed everywhere with portentous seriousness, showing the discontinuity of the popular mind in medicine, then as now. The worthwhile surgeons of the entire century—Wiseman, Fabry of Hilden, Purmann, Scultetus, Zambecari—can be counted on the fingers of one hand. Surgical instruction was so poor that, as all the authorities of the time opined, war was the only field in which it could be learned. The only other alternative for the apprentice, to ship as surgeon on a whaling vessel to Greenland, was worse than nothing. Difficult operations were seldom essayed as endangering the surgeon's personal welfare or entailing the loss of his practice. The surgery of the people and of the common soldier remained in the hands of the barber, the bath-keeper, the strolling fly-by-night quack who attended fairs, and to these was now added the grim figure of the executioner or headsman, whose skill in breaking bones on wheels and other phases of judicial torture³ was supposed to render him expert in bone-setting. Over all these, the scholastic physician, of pedantic, pompous type, lorded it with becoming dignity. In France exemplary respect for "the physician, our masters" was enjoined upon the surgeon, who did not attain his independence from physicians and barbers until 1743. In Prussia public examinations to test the fitness of surgeons were not required prior to the first medical edict of Mark Brandenburg (1685). The arbitrary separation of medicine from surgery was rigidly enforced in the field, the physician attending to internal complaints while wounds were left to the barber. The ultimate practice of having Physicians General and Surgeons General at one and the same time could only result in decentralized administration, both in the armies of Frederick and Washington.

In the 17th century the mediæval aspiration toward nationhood had become accomplished fact and standing or national armies existed in France, Austria, Sweden, Russia and the Mark or Electorate of Brandenburg (later Prussia). The main advances in military science were the subdivision of large masses of troops into tactical units or battalions of 600–800 men each, introduced by Gustavus Adolphus, the gradual substitution of musketry for pikes and halberds, with more efficient artillery. In consequence of these changes battle lines were spread over

³ Torture as a mode of compulsion or punishment was not abolished in Prussia until 1740, in Saxony until 1770, in Austria until 1776, in Holland until 1793. In other countries, it died out indefinitely, never existing in Sweden, where it was expressly forbidden in 1734. For the many refinements of cruelty which were sanctioned in the name of "judicial torture," see the illustrations in R. Quanter: *Die Leibes-und Lebensstrafen bei allen Völkern*, Dresden, 1901.

wider surfaces by deploying troops in thin, open-order arrangements. Under Gustavus Adolphus the soldier's burden of heavy armor and equipment was much reduced in weight, the manual of arms was highly specialized and the cavalry arm regained its prestige as "squadrons of horse" (*Reiterei*), armed with swords and pistols instead of lances. The French inventions of the flint-musket (1635) and the bayonet (1640) further influenced the fortunes of war. Gustavus Adolphus was more forward than any other military leader of the time in proper consideration for the sanitary welfare and medical treatment of his men, and was the first to uniform his regiments completely. In this period the army surgeon acquired a definite uniform, destined to become the distinctive costume of the practising physician in the 18th century, consisting of a tight-waisted *justaucorps* coat reaching to the knees, with the usual small clothes, stockings and buckled shoes. Specimens of these coats were exhibited at Dresden in 1911,⁴ and they are frequently depicted in the surgical treatises of Purmann and Heister.

The wars of the 17th century, in particular the Thirty Years War (1618-48) and those waged by Louis Quatorze (1672-97) were of extraordinary duration. In considering their effects upon military medicine it will be convenient to arrange the scattered material under the different countries.

*France*⁵

The ambulance hospital established at the siege of Amiens by an edict of Sully, minister of Henri IV (November 25, 1597), had been preceded in order of time, by the field tents or camp hospitals of Queen Isabella (1487), a camp hospital at the siege of Rouen (1591), and others, but it was so well managed by Pigray, a pupil of Paré, that even officers preferred to be treated in it (Heizmann). It was, moreover, the starting point of a number of attempts on the part of Henri IV, Louis XIII and their ministers, to improve the condition of the wounded and disabled soldier by the foundation of permanent institutions. As long as the siege of Amiens lasted, Sully himself went there regularly each month with a fund of 1,500,000 crowns, a goodly portion of which was destined for the hospital, frequented mainly by officers and "persons of quality," while provisions were made for the care of the wounded in neighboring villages. By edicts of Henri IV (1604-11) the *Maison de la Charité chrétienne*, founded in Paris by Nicolas Houel, was opened to destitute and disabled soldiers, with funds and administrative board, and this privilege was further extended to widows and orphans of soldiers killed in battle; but after the king's death in 1610 the arrangement went into abeyance through lack of funds. Edicts of Louis XIII (1611-29) revived the ancient Carolingian *droit d'oblat*, in virtue of which disabled and infirm officers and soldiers were assigned as lay brothers (*frères lais*) to monasteries, where they eked out their existence as sweeps, gardeners and bell-ringers. In January, 1629 an ordinance of Richelieu established the first stationary hospitals in the rear of armies in the field, and a state document of 1630 demonstrates the existence of one of these base hospitals at Pignerol, with adequate medical and surgical personnel.

⁴ Sudhoff: Dresden Catalogue, 1911, 319.

⁵ Cabanés: *Chirurgiens et blessés à travers l'histoire*. Paris, 1918, 146-200. Heizmann: *Ann. Med. History*, N. Y., 1916-17, I, 287-292.

Three years before Richelieu had improved field hospital service at the siege of Rochelle (1627) by the addition of personnel to insure the distribution of soups and medicine to all who could or would not seek assistance. In 1638 Richelieu published another ordinance providing for priests and cooks to look after the sustenance of the sick and wounded who would not go to the field or sedentary hospitals. By 1633 he had advanced to the idea of founding a disabled soldier's home or *Maison des invalides*, construction of which was begun in August, 1635. But after dedication of the scaffolding with great *éclat* on September 27 of the same year, the project was suddenly abandoned and came to nothing before the definitive opening in 1676. The disabled *invalides*, who had paraded with great pomp on this occasion, were sent back to their monasteries to resume the pensioned status of the *oblat*. During the reign of Louis XIV, through the good offices of Cardinal Mazarin, Le Tellier, the Secretary of State (1677-85) and his successor Sublet de Noyers (1636-43), funds were frequently found for assisting the wounded in the field; military hospitals were established at Arras, Calais, Dunkirk, Perpignan and elsewhere, and the administration of the regimental and base hospitals, formerly in ecclesiastical hands, was placed under an *intendant*. Pensions of 30-50 livres were granted to disabled soldiers; officers received 300-400 livres. But, in spite of these remarkable advances, the condition of the wounded in the field and in hospital left much to be desired, while the streets of Paris and the larger towns swarmed with lame, crippled, infirm and mutilated soldiers, whose physical status, as depicted in the etchings of Callot, was that of squalid beggary. The poor construction and administration of the military and civil hospitals, which consisted of little else than spacious halls in which the squalid patients were crowded three in a bed, made them nests of infection, held out little attraction to those who could get along without them and engendered the well-considered horror of hospitals which persisted until very recent times. The funds disbursed for care of the wounded were frequently embezzled by officers bent on libertinage in the capital, and many of the invalided preferred vagabondage to seclusion in convents. The increasing numbers of disabled mendicants in the capitol finally induced Louis XIV to carry forward the old plan of a *Hôtel royal des Invalides*, which was at length established by an edict of April, 1674, with the Secretary of State for War as Director. The institution was opened in 1676, with the inscription "*Laeso et Invicto Milite*" upon the imposing façade, but even here the inmates are described by Vauban, Langle and other observing spirits as poorly clad, ill-nourished, crowded two in a bed, and a general eyesore to the public. None the less, these developments are of the utmost importance as precursors of the final stage in which care of the wounded and disabled became a permanent function of government. The base hospitals led to the establishment of permanent garrison and port (naval) hospitals in France, but nowhere else, and after 1666, Vauban designated places for hospitals in all captured towns of Alsace and Flanders which he was called upon to fortify. In 1667 Louis XIV held a conference with Turbière, Bienaise and Gayant on improving the medical service of the army in Flanders, to which these men, the ablest surgeons then in Paris, were assigned, Turbière with the title of "Surgeon Major Consultant of Camps and Armies." The medical personnel of the army had increased to the extent that at the battle of Seneffe (1674) the intendant Robert was able to assign 230 military surgeons to three villages, with nurses and material adequate for the care of large numbers of wounded. In 1683 it was ordered that the sick be lodged before officers in campaign.

*Sweden*⁶

Gustavus Vasa (1523-60) created the first standing army for his country, made up of regiments of 12 companies (400-500 men), each company being provided with a barber

⁶ E. Knorr: Ueber Entwicklung und Gestaltung des Heeres-Sanitätswesens, Hannover, 1880, 652-660. Heizmann; op. cit., 292-294.

surgeon or "beard-shearer" (*Bardskärare*). At the same time a navy was started with a barber-surgeon for each ship. These barbers were organized into definite guilds, pledged to furnish medical personnel to the army in time of war. In 1613 each regiment of infantry had two barbers, each regiment of cavalry one. By an order of February 15, 1614 the personnel of an infantry regiment was increased to 3 company barbers and one regimental barber, at salaries which varied greatly with the times, viz., 8 thaler monthly in 1614, 48-80 thaler monthly in 1625. Under Charles IX (1611) a regimental barber received 40 thaler annually and 20 thaler for a uniform. Under Gustavus Adolphus he received 150 thaler annually, 50 thaler for clothing and abundant supplies. In 1625, one of the Swedish regiments of cavalry had 16 companies of 125 horse each, with 4 regimental barbers at 30 thaler monthly and 16 company barbers at 15 thaler monthly. In the armies of Gustavus Adolphus each regiment had at least 4 barber surgeons.

The Thirty Years War began with the battle on White Hill near Prague (November 20, 1620) and in the course of five years was transferred to North Germany, where Tilly and Wallenstein gained ascendancy at the battle of Barenburg (1626). Toward the end of June 1630 Gustavus landed an army of 13,242 men in Germany, 6 regiments of these being Scottish troops. On September 17, 1631 he defeated Tilly at Breitenfeld. The scene of war was then transferred to Bavaria, which was terribly ravaged by both armies. Gustavus was killed at the battle of Lutzen (1632). He was the greatest military genius of his time, and his medical arrangements were remarkable.⁷ Each general acted as commissary officer, distributing daily rations of bread and meat. Pillaging without leave was punishable by death; disputes over spoils were settled by turning the plunder over to the "next hospital;"⁸ civil hospitals, schools, churches and mills were exempted from pillage, and one-tenth of the spoils was set apart for the sick and wounded in hospital. The sick and wounded were usually left in captured towns to be treated in local hospitals, and wagon transportation of the wounded was sometimes employed. Enemy wounded were gathered in camp and sent to hospitals in adjoining towns. There were several precursors of the Red Cross convention in the Thirty Years War, notably at the siege of Domitz (1631), the surrender of Magdeburg (1636) and at Görlitz (1641). In spite of the care and forethought of Gustavus, his armies were steadily decimated by dysentery, typhus fever and plague and the frightful mortality of the native population during the entire Thirty Years War was largely due to the spread of these diseases by wandering soldiery on both sides. The opposing Imperialist armies under Wallenstein had field-barbers at 3½ *Reichstaler*, ranking between muster-clerks and trumpeters or blacksmiths, a general field-barber being attached to the general staff. Recruiting was done by impressment of the lawless and worthless in towns, pay of sick soldiers was continued three months, "if the flag still waved;" but little is known of the arrangements for care of the wounded.⁹

*Brandenburg*¹⁰

The fusion of the Mark of Brandenburg and the Duchy of Prussia under a Hohenzollern prince was not formally effected until 1701. In the armies of Elector George Wilhelm (1619-40), numbering 8,000 infantry and 2,900 riders, every regiment had a regimental barber and every company of infantry and cavalry a field-barber. His successor, the Great Elector (1640-88), created a standing army of 28,000-38,500 men, and increased

⁷ For which see, Joh. Heilmann: *Das Kriegswesen der Kaiserlichen und Schweden zur Zeit des 30-jährigen Krieges*, Leipzig & Meissen, 1850, pp. 158, 192, 245, 269, etc., cited by Köhler.

⁸ Among these was the Waldstein Soldiers' House, erected by Gustavus for wounded and infirm soldiers and richly endowed by Queen Christiana (Heilmann, op. cit., 269).

⁹ See A. Köhler: *Berl. klin. Wochenschr.*, 1913, LV, 1082-1084.

¹⁰ Knorr: *op. cit.*, 64-73.

the medical personnel by a cornet-physician (*medicus de cornu*)¹¹ and a staff barber, both attached to the general staff, while troops quartered in the larger cities had also garrison-physicians, who treated the officers for internal diseases and devised sanitary measures during epidemics, and garrison-barbers, who were ordinary wound-surgeons. Dispensation of drugs was in the hands of field-apothecaries, subordinated to a staff-apothecary. There were no hospitals at this time, the sick and wounded being treated in quarters. In the reign of Frederick I (1688-1713) the company-barbers, formerly subordinated to the captain of the company, became subalterns of the regimental barber. In the time of the Great Elector the regimental field-barber ranked between a field-clerk and a drummer and got 8 thaler as pay. According to Baas, a company barber got the equivalent of 11-15 marks monthly in the infantry and 11.40 marks in the cavalry (raised to 27 marks in 1655). The regimental barber got 30 marks in 1638, 15 marks in 1639, 27 marks in 1655 and 52.80 marks in 1685, while the pay of a Saxon *Feldscheerer* in 1613 was 33 marks monthly. During the Thirty Years War and after the *Feldscheerer* did the duties of regimental surgeon, regimental barber and standard bearer combined.¹² The regimental barber had several apprentices under him, who assisted at operations along with the company barbers. Purmann, who was company and regimental barber in the armies of the Great Elector during 1667-1679, records that his regiment had 4 apprentices, the most liberal allotment in the whole army. As described by the writers of the time, the training of these apprentices was the poorest conceivable, consisting of little more than practice in curling wigs or trimming hair and beards. The Great Elector was, however, extremely solicitous about the transportation and care of the wounded. In an order of 1675 he censures his field-marshal, George, Prince of Anhalt Dessau, for neglecting this duty, and commands him to find places for receiving the wounded and to punish officials who did not comply with this obligation. After the battle of Fehrbellin (1675) he issued an order to the city commandant at Spandau (July 21) to provide three wagons for the wounded, with plenty of straw bedding inside, and with hoops fastened above and festooned with green bushes, to protect from the sun. Each of these wagons was commanded by a special officer. One of his marching orders, of date November 7, 1670 states that, for the transportation of the sick, as many conveyances as necessary or possible were to be commandeered, to be released successively as places were reached in which patients could be housed. An order of December 27, 1677 commands the magistrate of Stettin to provide not only quarters for the sick and wounded, but also medical care and attention. The Great Elector's hygienic ordinances for the construction of buildings against the pest, and for the sanitation of wells and streets (1641-60) are also progressive in spirit. On November 1, 1685 he instituted the Medical College of his Electorate.

*Switzerland*¹³

In the 17th century the military power of Switzerland sank to a low ebb, due to the constant internecine warfare over religious creeds and to the fact that the best of the manhood of the nation was employed elsewhere as mercenary soldiery. During the Thirty Years War the Swiss were unable to maintain neutrality and protect their frontiers from invasion. Their largest mobilization was that for national defence when Louis XIV threatened Burgundy in 1668. The muster rolls of the different cantons throughout the century show that each company of infantry, artillery or cavalry had a field barber, and

¹¹ So named because attached to the cornet, a cavalry-formation, the standard-bearer of which had also the title and rank of "cornet."

¹² A. Köhler: Arch. f. klin. Chir., Berl., 1914, CV, 781-784. Participation of army surgeons as combatants was common in the Swiss, Prussian and English armies in this period.

¹³ Brunner: Die Verwundeten in den Kriegen der alten Eidgenossenschaft. Tübingen, 1903, 192-229.

in the second half of the century, there were also regimental barbers for the larger formations. The three regimental barbers of Zürich (1682) were experienced surgeons, including the city physician and chief surgeon of the city hospital. In 1683 the General Staff of the Bernese Army had a field physician, field barber-surgeon and field apothecary. In the *Defensionale* of 1688 there is no mention of sanitary organizations for the large force then mobilized. The field physicians were provided with medicine chests. In 1687 Johann von Muralt of the Zürich forces drew up directions for packing one of these chests, which with the rules he gives for the treatment of gunshot wounds of different viscera, are far superior to anything else of the period. The pay of the field barbers was 10–12 kronen monthly. The instructions for field-barbers in the War Manual of Capt. Lavater (1657) are taken from Fronsperger. The city accounts of the different cantons (with *Feldschers*) for the care and treatment of the wounded show liberal expenditure of public moneys for this purpose. An extensive account of the city of Lucerne with the executioner Balthazar Mengis¹⁴ suggests, in its details, that this functionary was also an expert bone-setter and wound surgeon.

*England*¹⁵

In the reign of Queen Elizabeth English forces were frequently employed in Ireland, and during these Irish wars there was much hardship and depletion of personnel by disease, through lack of proper medical arrangements and officers. At this time there was "only one apothecary in all Ireland," and while Campion noted young medical aspirants "conning by rote the aphorisms of Hippocrates," physicians were few and far between. In consequence of the damp climate, the hard life in the bogs, poor food-supplies, and general bad management, epidemic dysentery, mortification of wounds, plague and other diseases did their work, and the royal forces were frequently so decimated that they were often at the mercy of their opponents. In the meantime, Irish soldiers were frequently employed by the English forces for service abroad. Through native brawn, length of limb, high spirits and unfailing courage, these Irish "kerns" and "gallowglasses" early demonstrated themselves to be remarkably efficient soldiery, and like the Swiss, were soon to be hired for this purpose all over Europe. Beyond an unprecedented raise in pay to £5 a week for the physician of the commander of the troops in Ireland (Lord Deputy Mountjoy), the disastrous results of these Irish campaigns excited little concern among the military authorities, probably by reason of the poor quality of medical personnel everywhere at this time. William Clowes, the satirist of English surgery in the period, writes in 1596:

"It is most truly said there is no coine so current but hath in it some counterfeits, which make it suspicious, so it is there is no profession so good but hath also some counterfeits, which breed in it disgrace; and none so much, I suppose, as there bee in some these daies, that take upon them the honest title and name of traveling surgeons. . . . Therefore friendly reader, let this be a warning unto thee, to take heed of these unclean birds, who do daily abuse many worthy persons, captaines, gentlemen, masters of ships and merchants of good account, by reason of their shameless braggings and boastings of their great, divine, magnificent skills in physick and surgerie, wherewith they say they are adorned and exceed all others, under color hereof, by their fraud and subtle means. . . . Truly many a brave soldier and mariner hath perished, and sometimes the Generall and Captaines themselves."

¹⁴ Brunner: *op. cit.*, 212–214.

¹⁵ A. A. Gore: *The Story of Our Services under the Crown*. London, 1879, 41–73. H. A. L. Howell: J. Roy. Army Med. Corps, Lond., 1904, II, 606–737.

The Thirty Years War drew a great many English, Scotch and Irish soldiers into Germany, and although these expeditions were accompanied by medical officers, these too suffered great privations from cold and were frequently cut off in their prime through the ravages of epidemic disease. The pay of medical personnel at this time was about 6s. 8d. per diem for physicians and surgeons, 2s for "barber surgeons," 6d. daily for "under barber surgeons" and 3s. 4d. for apothecaries. The assignments were, as elsewhere, one surgeon for each troop of infantry, horse or artillery. The Cromwellian forces in Ireland had an apothecary general, but were otherwise but indifferently supplied with medical personnel, and there was still a great scarcity of native Irish physicians. Petitions of army surgeons that they be dispensed from transplantation to Ireland as colonists are on record. Wounded officers were sometimes carried on horse litters and sheltered in the castles of the nobility, but the lot of the sick and wounded soldier was undoubtedly hard. Sick and wounded Irish were frequently hidden in caves. Prior to this time, Charles I, to raise medical personnel for his French and Spanish expeditions, had, in 1626, authorized the Corporation of Surgeons of London to increase the pay of surgeon majors to 5s. daily (about 25s. present money) with a surgical chest worth £48, of surgeons to 2s. 6d. daily and of mates 1s. daily, with the customary stoppage of 2d. monthly from each soldier's pay for medicines, and a surgical chest worth £17 to each surgeon attending 250 men. The Corporation was also authorized to raise surgical personnel by impressment, and to appoint 10 examiners to ascertain the fitness of candidates for admission to the Corporation. The Bishop of London or Dean of St. Paul's, with this board were empowered to examine all practitioners in surgery, up to the Statute of 18 George II in 1745. Before this time the Corporation of Surgeons acted as Directors General of both army and navy. In spite of all this, and of the very liberal allotments of surgical chests, there continued to be great suffering among the troops during the Parliamentary Wars from the rigors of climate and the effects of communicable disease. The devastating epidemic at the siege of Reading (1643), as described by the clinician Thomas Willis (himself a private soldier at that time), was either typhus or typhoid fever, or perhaps a combination of both. A Parliamentary resolution passed on March 6, 1643 empowered the raising of parochial funds for the relief of disabled soldiers and the widows and fatherless children of slain persons (Gore). During the reign of Charles I the army in Ireland had a physician general, the British East India Company had a surgeon general, and regimental surgeons and surgeons' mates were added to the medical personnel. The few physicians of any ability attached to armies came either from Oxford or the continental universities. Among these were the celebrated Richard Wiseman and William Harvey, both attached to the Royalist Armies, Dr. Edward Verney, the King's standard-bearer, who was killed at Edgehill; Dr. Wilson, the King's physician, who later shared his captivity at Hampton Court, Thomas Skinner, physician to Monk in his Scotch campaigns, and the anatomist Monro, attached to the Scots regiments. With the fall of the Commonwealth and the accession of Charles II (1660), the Parliamentary army was disbanded, and the Royalist forces were cut down to eventually four regiments and the Guards (1680), a force of about 5,000 men, with regimental, instead of company surgeons. During the occupation of Tangier by British forces (1664-84), the suffering and losses among the troops are described as immense and the services of the surgeons arduous. On October 27, 1679 a Royal Hospital for aged and disabled soldiers was established at Kilmainham, near Dublin. A private retreat for the same purpose had been established at Hereford by Sir Thomas Coningsby in 1614. Chelsea was founded in 1663 and Greenwich (for seamen) in 1695.

Upon the accession of James II (1685) new regiments were added to the Regular Army, necessitating an addition of 11 surgeons and 11 surgeons' mates, and a regulation was

issued granting a pension of one year's pay from the "King's Bounty," for loss of an eye or limb, upon certificate of the chief medical officer of the army, now called "surgeon general." At this time it was customary for medical officers to hold double commissions, receiving pay both as combatants (ensigns) and for hospital duties. The pay list of 1686 gives a surgeon 6s. 6d. per diem and an ensign 3s. per diem. The medical officer wore the bright scarlet uniform of his regiment. After the Revolution of 1688 and the accession of William III, nine regiments, with medical officers were added to the army. The siege of Londonderry and other features of the Irish campaign again occasioned great suffering from disease. Some 24 French surgeons were added to the forces in Ireland in 1690. Of this army Dr. Patrick Archibald was "Chirurgion General" and Sir. Patrick Dun, Physician General (1688) at 10s. a day. The latter was succeeded in 1713 by Sir Thomas Molyneux. The depredations of the armies of Louis XIV in the Palatinate led to the Grand Alliance of 1689, in which English forces participated until the peace of Ryswick (1697), after which the British Army was cut down to 7,000 men, with a corresponding reduction in medical personnel.

*Russia*¹⁶

The development of the Scandinavian-Russian civilization was terribly impeded by the Mongol invasions and Russian medicine owes its origins to the Romanoff dynasty (1613-45), under whom a Ministry of Medical Affairs (*Aptekarski Prikaz*) was founded in 1620. Prior to this event, many English and other foreign physicians had been invited to settle in Russia by Ivan III and Ivan IV (1468-1584). This Ministry, the starting point of the patriarchal organization of medicine in Russia, had for its origins sundry drug-stores or medical supply stations for the dispensation of medicines. Its president was regarded as the highest official in the Empire, and its membership included the body-physician of the Czar. In 1615 a physician attached to the army is mentioned in the archives, and again, in 1631, when the forces were increased, both subordinated to the Medical Ministry. Prior to this time, sums of money were set aside to pay barber-surgeons for the care of the sick and wounded in campaign. In the second half of the 17th century regimental field dispensaries were instituted, with funds of 200 rubles per annum. These developments were materially forwarded by Peter the Great (1690-1725) under whom the Ministry of Medical Affairs became a Chancellery in 1707. A ukase of 1716 assigned to each division of the army a physician, a staff-barber and two apothecaries, a surgeon to each regiment, and a field-barber to each company; at the same time, field hospitals were instituted.

*Military Surgery in the 17th Century*¹⁷

Frederick the Great relates in his Memoirs that in the armies of the Great Elector one-third of a battalion were armed with pikes, two-thirds with muskets, and that not before 1700 were the entire infantry provided with firearms. Canister (caseshot) and bomb-shells were employed in the artillery, the latter usually as hand-grenades. The iron ramrod, introduced by the Prince of Anhalt-Dessau (*circa* 1698-1718) enabled the infantry to load and fire with greater rapidity. At first the round lead bullets seldom underwent deformation by reason of the slight propelling power of the charge, and in consequence, as

¹⁶ Knorr: *op. cit.*, 384-392.

¹⁷ For further data on the subject, see Koehler: *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Berl., Heft. 13, 1899, 41-50.

Wolzendorff: *Deutsche med. Wochenschr.*, Leipz. & Berl., 1892, XVIII, 550-553.

becoming rapidly encysted in the blind canals created, were frequently allowed to remain within the body until a favorable opportunity or an actual necessity for removal. But with greater propulsive power in the weapons there was eventually deformation of the projectile with laceration and mangling of the tissues, which was even more pronounced in the case of bullets of stone, iron, copper, glass or slag. Such wounds were almost invariably the seat of suppuration, all the more exaggerated through the practice of widening the wound by the surgeon's fingers or instruments to remove the bullet, and the then common practice of primary débridement. All the surgeons of the century were keen for prompt removal of the bullet, and Paré's teaching having obliterated the notion that gunshot wounds could be poisoned, surgeons were only too ready to explore open wounds with dirty fingers. The whole matter remained a ghastly chapter until cleared up by the teaching of Lister and La Garde. In the 17th century gunshot wounds were dressed with strange salves, compounded of nauseating ingredients, boiled with turpentine or camphor, happily disinfected by the heat in the first instance. If in spite of this there was septic fever, blood-letting was instituted at once. The almost universal stuffing of wounds with charpie was a frequent cause of infection and hospital gangrene. Such superstitions as the weapon salve, the sympathetic powder, and the "transplantation cure" (dipping a bit of wood in the blood or pus of the wound and pegging it into a tree) were at once phases of the curious doctrine of "action at a distance" and a vague groping toward the rational plan of leaving the wound to heal of itself. If the sliver of wood grew into the tree, the wound would heal over. These superstitions, while ridiculed by Purmann, Fabricius, Würtz and the other surgeons, did not die out until the middle of the 18th century, and were even recommended to Frederick William I of Prussia (during an attack of gout) by two of his generals, in 1737.

The 17th century was the great period of amputating limbs, which was done with reckless profusion by the half-instructed surgeons of the time, until the stand taken by Frederick the Great and the strong protest of Bilguer in 1768 put a stop to the fashion. Wholesale lopping off of limbs oftentimes resulted in the speedy death of the patient from shock and hemorrhage and filled the streets of the cities with mendicant cripples, whose grotesque yet wretched status has been forcibly commemorated in art by Bosch, Brueghel and Callot. The principal indications for amputation were cold, dry and moist gangrene, but unfortunately the apprentices resorted to any excuse for practising on their patients to bolster up their own conceit. Fabry of Hilden, in his treatise on gangrene (1593), was the first to recommend amputation

above the diseased part, and improvised a rude tourniquet to shut off the circulation, consisting of a ligature tightened by a stick of wood. The cautery was still used to check hemorrhage and pain was sometimes annulled by the old mediæval device of allowing the patient to breathe a sponge steeped in a mixture of opium, hyoscyamus and belladonna. It is said that Würtz taught the immediate closure of chest wounds before Larrey, but, as this doctrine was opposed by Fabry, such wounds were treated by widening, drainage, injections and paracentesis of pus. Gunshot wounds of the abdomen were sometimes drained, but in spite of the current belief in "laudable pus," the general practice of drainage in wound-treatment was not standardized until the advent of John Bell. Gunshot wounds of the urethra were noticed by Purmann, Hutter and Scultelus.

The leading English exponent of military surgery was Richard Wiseman (1622-76), who served with the Royalist forces and who summed up his extensive experiences in his treatise of 1672 containing many case histories. He employed primary amputation in gunshot wounds of the joints, first described scrofula (King's Evil) and tuberculosis of the joints (tumor albus), and in his treatise on gonorrhœa, mentions the first case of external urethrotomy for stricture, which he performed with Edward Molins in 1652. The first case of flap amputation is recorded by James Yonge (1679). In Matthæus Gottfried Purmann (1649-71),¹⁸ who served in the Brandenburg Army for nine years (1671-79), the Great Elector had, attached to his service, the best German surgeon of the time. He was a bold, resourceful operator, even invading the brain and the clavicle for bullets, and his fifty cases of gunshot wounds (1693) and eighty curious observations (1710) include bronchotomy, suturing of the intestines, trephining (40 cases), lithotomy, eye surgery and orthopedics. His experiences covered the battles of Fehrbellin and Rathenow and all the sieges of Pomeranian towns. He complains bitterly of the difficult extraction of splinters from wounds made by glass hand grenades. Wilhelm Fabry of Hilden (1560-1624), the father of German surgery, wrote important treatises on gangrene (1593) and lithotomy (1626) and left another admirable set of 100 case histories (1606-46). He reasoned that head injuries may cause insanity, extracted iron splinters from the eye with a magnet, devised an aural speculum and the first field chest of drugs, based upon the model proposed by Mority of Nassau (1612). Johann Schultes (1595-1645), called Scultetus, published in 1653 an atlas of surgical operations and instruments, which, with the later treatise of Heister (1718) is our principal source-book for the graphics of operative procedure in the time.

In France Nicolas de Blegny (1652-1722) invented the elastic truss (1676), and Morel introduced the tourniquet (1674) which was successfully applied in ligating the femoral artery at the Hôtel Dieu in 1688, and Jacques de Beaulieu (1651-1719) or Frère Jacques, a strolling incisor, introduced the lateral operation for stone (1697).

In Italy Cesare Magati (1579-1647) taught the treatment of gunshot wounds with bandages soaked in plain water, and Giuseppe Zambeccari was a remarkable pioneer in experimental surgery of the viscera, employing dogs for this purpose. Pietro de Marchetti (1589-1673) left one of the best repositories of medical and surgical cases (1664). The surgical knowledge of the earlier period is summed up in the gigantic *Thesaurus* of Peter Uffenbach (1610).

¹⁸ For a full account of Purmann, including his autobiography, see Köhler: Veröffentl. a.d. Geb. d. Mil-San.-Wesens, Berlin, 1899, 13 Heft. 86-114.

Epidemic Diseases

Throughout the whole of the 17th century the European peoples were harassed by almost continuous wars or the natural sequels of lengthy wars, viz., devastating disease and starvation. During the Thirty Years War the opposing armies marched and counter-marched all over central Europe, and wherever they went, wherever they were camped or billeted, they were at once victims and carriers of bubonic plague, camp dysentery, syphilis, typhus and typhoid fevers, while, through their reckless destruction of material supplies and the impossibility of continuous sowing and harvesting, famine always went in their train. The story of these miseries, too lengthy to be repeated here, has been told in all its ghastly details by Gottfried Lammert (1890)¹⁹ and Englished by Prinzing (1916).²⁰ By the end of the Thirty Years War Germany was a ruined, desolate country, its population reduced from 16-17 millions to 4 millions (Lammert).²¹ According to the *Excidium Germaniae*, "one could wander ten miles without seeing a soul, scarce a cow." By the 17th century leprosy had been almost completely stamped out, and the lazar-houses were abolished, but bubonic plague was rampant everywhere, with a mortality of 127,000 in Moscow (1601-03), 80,000 in Milan (1630), 69,000 in the Great Plague of London (1665), 70,000 at Vienna (1679), 83,000 at Prague (1680), and over 500,000 in the Venetian Republic. Next to the plague typhus fever (Hungarian disease) was most fatal in its incidence. Hungary was called "the German's graveyard." Influenza and ergotism were common. Small pox was pandemic in 1614 and epidemic in England in 1666-75, eventually reaching North America, where yellow fever was already endemic. Scarlatina, described by Doering (1625-8) and Sennert (1628), was first clearly differentiated from measles by Sydenham (1676). Infantile mortality was exceptionally high in this period.

*Account of Pediculosis in Army Camps by Tobias Cober (1606)*²²

In 1606 Tobias Cober, a physician of Görlitz (Bohemia) who had seen seven years military service in the "Long War" between the Hungarians and the Turks, published three series of "Medical Observations in Hungarian Camps," in which he gives a lengthy account of the prodromes and symptoms of camp typhus, then known variously as *morbus hungaricus*, *lues pannonica*, *languor pannonica*, etc. In noting the effects of mental excitement and fatigue in predisposing to the disease he refers particularly to the mental irritation produced by the swarms of mosquitoes, gnats and lice that infested the camps. The following extract is perhaps the first account of pediculosis in camp:

With these foregather the most terrible pediculi, hardly to be thought of without a sense of discomfort, which in themselves, through their constant promenading and sucking of the body, are enough to stir up one's bile. For it is impossible to avoid the bites of these miserable creatures, especially in the first years in the field, as they enjoy a sort of right of citizenship in all camps. The atmosphere is so lukewarm, mild and stuffy that when

¹⁹ G. Lammert: *Geschichte der Seuchen, Hungers und Kriegsnot zur Zeit des Dreissigjährigen Krieges*. Wiesbaden, 1890.

²⁰ F. Prinzing: *Epidemics resulting from Wars*, Oxford, 1916, 25-79.

²¹ Prinzing (p. 77) regards this as exaggerated, as other estimates claim that Germany lost one-half its population. Saxony lost 934,000 in 1631-2 alone. The population of Bohemia is said to have decreased from three millions to 780,000, and Württemberg from 444,800 to 97,300.

²² T. Cober: *Observationum medicarum castrensiarum Hungaricarum decades tres*. Helmstädt, 685, 49-51.

clothes which have been washed in swamp water are exposed to the sunlight, they are seen to swarm with these "vermibus Syllanis." One cannot hope therefore to get away from these constant attendants and companions, as they seem to arise from the very moisture of the body itself. At first I thought to rid myself of the pest by constant change of newly washed clothing, but even this seemed to bring them more and more into play, instead of destroying them. And this phthiriasis, which even the Egyptian magi of old could not produce, but which in these localities every one can create in his own person, can, as I bear witness, drive a man into fury. For as often as I was bitten by these miserable, abject animalcules, I gave full rein to my anger, fairly gnashing my teeth with rage, and cannot even now think of them without vexation. . . . One cannot ward off these armed six-footed Turks even with iron and steel. . . . And among many soldiers I have noted the frightful spectacle that this fearful plague of lice had gone far enough to cover the whole nape with ulcers, the flesh not only excoriated to the breadth of one or two fingers, but actually excavated, the men condemned to this miserable fate dying with groans and lamentations.

*A Camp Hospital Regulation of the 17th Century*²³

The armies of the *Landesknechte* had occasionally a few tents (*Krankenzelte*) set up for the sick and wounded in camp, but the first definitely organized military hospitals in Germany were those authorized by Elector Maximilian of Bavaria in 1620 for the armies of the Catholic League. One of these was an interim hospital or casualty clearing station in the field, the other a permanent main hospital in the nearest town. None of these earlier camp hospitals were mobile field hospitals of recent type; the term "field-hospital" is applied to them by courtesy. In June, 1685, following the bloody battle of Fran between the Imperial forces and the Turks, the Brunswick troops acquired field or camp hospitals, and a set of regulations for these was drawn up by Konrad Barthold Behrens (1660–1736) and published in 1689.²⁴ These hospitals were massive, many-storied buildings, run up in the vicinity of the camp, on good sites in the neighborhood of wood and water. Dysenteric or other patients were segregated in well ventilated rooms, according to diseases; yet while strict cleanliness is enjoined in the regulations, hospitals were not popular with the sick, and the caution against the passage of faeces and urine through cracks and knotholes into rooms below, points to jerry-building and the squalor of the time. The personnel consisted of the physicians, whom the patients were allowed to choose, the field-barbers, apothecaries and attendants, usually priests, captains and female camp followers, the whole supervised by an officer with soldiers. The duties of the physicians were to detect malingering and to prescribe diet and medicines for the sick, but with 800 sick soldiers daily in 1685, only a word could be devoted to each patient, and the order had to be carried out by the barbers, the medicines being subsequently prepared by the apothecaries in the presence of the physicians. The apothecaries were required to keep a full supply of medicines on hand, making timely requisitions where necessary, and relying mainly upon vegetable simples, for economic reason. Candles, salt, sugar, olive oil, nutmegs, oatmeal, rice, red wine, brandy, juniper berries and vinegar were regarded as the main staples. The patients lay upon linen sacks filled with straw and a plentiful supply of linen for bandages is specified. To each hospital was attached a *commisarius* or finance officer, who provided funds and regulated the accounts. A picture of the interior of a military hospital of the period forms the frontispiece of Andreas Hütter's *Fifty Surgical*

²³ W. Haberling: *Arch. f. Gesch. d. Naturwissensch. u. Technik*, 1918, VI, 150–159.

²⁴ K. B. Behrens: *Consilium oder rätliches Gutachten wie ein Soldat im Felde für Kranckheiten sich hüten und denselben zur Noth begegnen könne*, Hildesheim, 1689. For the text of the regulations, see Haberling: *op. cit.*, 156–169.

Observations (1718).²⁵ It represents a large commodious ward, opening by an arched doorway upon the distant camp, through which the wounded are brought in on litters, while the surgeon and his apprentice, in *justaucorps* coats hover about the beds. The furniture (beds, table, chairs) is of the heavy, ornate, household type, and was probably obtained from neighboring residences.

*Attempts at Regulation of Prostitution in Armies*²⁶

Never were mobilized armies so beset and hampered by hordes of camp followers as during the Thirty Years War. Schiller states that at the siege of Nuremberg (1632), there were 15,000 loose women in Wallenstein's camp alone and Wallhausen (*Defensio patriae*) counted 4,000 women and their offspring attached to a single regiment of 3,000 Germany infantry, the 300 wagons of the train being loaded down with these camp-followers and their plunder. In 1648 at the end of the war, General Gronsfeld reported to Elector Max of Bavaria that the Imperial and Bavarian armies consisted of 40,000 soldiers, who drew rations, and 140,000 prostitutes and camp-followers, who drew none. In 1650 the four Swedish companies that revolted at Köthen numbered 690 soldiers, 650 women and 900 illegitimate children. This condition, an essential feature of the then current concept of the regiment as the "home of the soldier," persisted *diminuendo* until the end of the 18th century. In the earlier period these kept women, plying their various avocations as laundress, sempstress, cook, sick-nurse, midwife, bar-maid and concubine, had the strongest hold upon the soldier, and the various devices resorted to by commanders to get rid of them were speedily outwitted by the troops themselves, in spite of innumerable orders and regulations everywhere. The first plan hit upon, explicitly stated in the Articles of War of Maximilian II (1570) and repeated in the cavalry regulations (*Reiterrecht*) of Wallenstein (1617) and those of Gustavus Adolphus (1621) and the Great Elector (1656), was to forbid any women in camp, unless duly wedded soldiers' wives. But this only resulted in countless "drum-head marriages," often with women of the lowest character (Wallhausen records as many as 800 marriages in two days). Attempts to leave the horde (*Weibertross*) stranded in crossing a stream were always circumvented by the humorous protests of the soldiery, who declined to march farther. Regulations, such as those of Ferdinand III of Hungary (1643-1645), authorized the driving away of women with whips and by heavy fines for the soldiers, but are said to have only increased the number in the long run, due to the general starvation of the people, and the fact that an adventurous

²⁵ For reproduction of which see Wolzendorff: Deutsche med. Wochenschr., 1892, XVIII, 553.

²⁶ W. Haberling: Das Dirnenwesen, etc. Ztschr. f. Bekämpf. d. Geschlechtskr., Leipz., 1914, XV, 312-326.

camp career permitted a livelihood by theft and plunder. Military orders, too numerous to mention here, went the length of severity, but such barbarous devices as cutting off ears and noses or that of *passer par les verges*, were unavailing, until troops were quartered in closed barracks. The wretched offspring of soldiers' mock marriages were doomed to fill the brothels and thieves' kitchens. Almost nothing is said of syphilitic infection in the military regulations of the time, although Fronsperger, in his Navy Regulations, had mentioned it as a reason for not permitting women on board ship. In his "Discourse on the present German Army" Count John of Nassau-Siegen, one of the leaders in the Protestant Union (1608),²⁷ filed a vigorous protest against the *Weibertross*, proposing that they be excluded rigorously from camp, "to prolong the soldiers' lives and to protect the camp from contagious diseases." This is again repeated in the Spanish Articles of War of 1681 and in the ninth article of an edict of the Magistrate of Strassburg (1684), in aid of protecting the troops quartered there "from infection." It was not before the middle of the 18th century (1750) that orders began to appear authorizing medical treatment of diseased camp-followers prior to imprisonment. Success in suppressing vice and disease in armies varies inversely with the number of troops mobilized. In the 17th century it was not possible, even with the smallest detachments.

The Exhortations of Gehema

Across the four centuries comes a voice raised to denounce the indifferent care of the sick and wounded soldier by the half-baked medical personnel of the period, a voice crying in the wilderness. It is that of Janus Abraham à Gehema (1647-1715),²⁸ a Polish knight and master of horse, who, orphaned in childhood, trailed a pike in the Low Countries, studied medicine at Groningen, Leyden and Utrecht, and like most rolling stones of the time,²⁹ served in nearly all the wars of the period in various capacities, to settle down finally in Berlin as court physician and upper-herald to Frederick I of Prussia. In his roving life he seems to have married five (some say seven) wives in succession and to have turned out, along with a large family of children, some thirty books bearing such queer titles as "Gout Conquered by a Chinese Weapon, the Moxa" (1683), "The Best Way to Kill Time" (1686), "The Noble Drink, Tea" (1686), "The Conscientious Wet-Nurse" (1698), "Two and Twenty Fever Cures" (1702), etc. His fame rests

²⁷ W. Haberling: *op. cit.*, 173-174. The text is said to be in the Dillenburger Archiv at Wiesbaden, K. 938.

²⁸ For the life of Gehema see Köhler: *Veröffentl. a.d.Geb. d. Mil.-San.-Wesens*, Berl., 13. Heft, 1899, 52-85.

²⁹ Another roving character of this order is described by A. Köhler in *Berl. klin. Wochenschr.*, 1918, LV, 1083.

securely upon three books which are now highly prized and esteemed, namely, "The Well-Experienced Field-Physician" (1684),³⁰ "The Officer's Well-Arranged Medicine Chest" (1688),³¹ and "The Sick Soldier" (1690).³² In these Gehema appears as a notable exhorter and hot gospeller for the soldier's welfare, garrulous at times like Paré or Paracelsus, but with the same native fire in his soul that is apparent in the great medical reformers of the Renaissance.

The burthen and plaint of his argument is that through the divorce between medicine and surgery, hundreds of soldiers had to die because they were attended in illness, not by the field-physician, but by ignorant barbers, and then usually not even by the regimental barber, but only his apprentices, who were as little fitted for the surgical calling as "a jackass at a dance"; furthermore it was hopeless to attempt to keep a field army of 20,000-30,000 men in good condition with but one physician at best to look after them and with field-chests filled with idiotic remedies. These chests, Gehema maintained, should be furnished not out of the physician's pocket but by his government. The pictures given by historians of the low status of medicine in the 17th century are usually taken from Gehema, whose books afford the most vivid sidelights on the military medicine of the times. "Can there be," he cries, "any more miserable creature under the sun than an unfortunate soldier? O ye officers! think that such an one is not made of wood or stone, but is a man and exposed to the same chances as yourselves. . . . Few indeed have I seen who took enough pity on the sick soldier to visit his bedside, give him some attention and send him food, which would cost very little."

To Gehema's protestations, however, the 17th century authorities were as indifferent as the pest-doctor of the time, who saw his patients behind a pane of glass, while his apprentices attended them. Speaking of the lengthy literary productions of the period, James Russell Lowell observed, with the exaggeration of American humor, "We wonder at the length of face and general atrabilious look of the men of that generation, but it is no marvel when even their relaxations were such downright hard work." The gloomy sepulchral spirit of the 17th century is expressed in the lines of one of its poets:

"Devouring Famine, Plague and War,
Each able to undo mankind,
Death's servile emissaries are"

and this mortuary feeling, if nowise apparent in Spinoza or Molière or Rubens, is to some extent perceptible in Milton, in Bach, in Bunyan and Sir Thomas Browne. It was not without reason that Mazarin inquired concerning any commander recommended to him, if he possessed the cheerful, fortunate disposition necessary to the successful conduct of military operations—*Est-il heureux?*

³⁰ Wohlversehener Feld-Medicus, Hamburg, 1684.

³¹ Wohleingerichtete Feld-Apotheke. Bremen, 1688.

³² Der kranke Soldat. Stettin, 1690.

CHAPTER VII

The Eighteenth Century

The 17th Century, a period of almost continuous wars, of intense individualism in science set off by a distinct backward trend in practical medicine, was now to be succeeded by a phase of relative quiescence, interrupted at intervals by wars of brief duration, but tending, in the end, to a social order in which everything was to be regulated by sober-sided method and system. It was the illusory resting stage of apparent contentment with "the best of possible worlds,"¹ which preceded the stormy years of the French Revolution and the Napoleonic Wars. Carlyle characterized the 18th century as "spendthrift, fraudulent, somnambulistic, bankrupt," tending naturally to its suicidal end; and there is much in his formula for the general law of its being: "Souls extinct, stomachs well alive."² In this artificial, somewhat shallow and highly materialistic age, the powerful and prosperous enjoyed a degree of elegant leisure almost inconceivable today and only comparable with that of the later Roman period; but underneath the veneer and varnish the miserable status of the less fortunate can be definitely sensed from the Hogarth drawings, the novels, memoirs and police records of the time. The solemn, lengthy, cadaverous faces of the 17th century give way to the ruddy, heavy-jowled, eupeptic personalities of the three-bottle men.³ Each person had a definite place in the scheme of things, and in it he was expected to remain. Medical practice was passed on from father to son. Doctor, lawyer, divine, soldier, courtier, tradesman, had each certain peculiarities of costume, manner

¹ Leibnitz emitted the famous dictum "*Tout est pour le mieux dans le meilleur des mondes possibles*," ridicule of which was the motive of Voltaire's "*Candide*."

²It is to be noted that this is the viewpoint, not of the professional moralist or clergyman, but of the sardonic humorist that Carlyle happened to be. To the conventional-minded the 18th century is the ideal and idyllic period of sober quietism and virtue rewarded, as sensed in the Mozart or Haydn symphonies, the Händel oratorios, the Reynolds and Gainsborough canvases, the literary productions of Addison, Goldsmith, La Fontaine, etc. The history of the hospitals, psychiatry, infant mortality, and poor-laws, tells a different story. The poetry is artificial; the music "tailor-made." Bach lived in the 18th century, but his music is of the 17th century in its deep religious feeling and its ineffable sadness—a requiem for those lost in the Thirty Years War. Stendhal (Napoleon's quartermaster) lived in the 19th century, but is a typical 18th century figure.

³ Gibbon was so corpulent that when he proposed to Mademoiselle Curchod, he was unable to rise from his kneeling posture. Chodowiecki's etching, "A physician's proposal of marriage," summarizes this phase. The Romeo is stout; the soubrette stouter.

and intonation that identified them, like players in a stock company,⁴ and even knaves and blackguards acted up to their respective parts with *aplomb* and precision. Extreme servility in dedicating books and in other approaches to noble patrons was regarded as correct procedure. The advent of such dynamic, independent personalities as Frederick the Great, Dr. Johnson, Edmund Burke, John Hunter, Napoleon or Beethoven was as a series of shocks of high voltage to a society that permitted Mozart to starve and to be kicked downstairs by an archbishop's lackey. Oliver Goldsmith noted with precision the birth of a more modern trait, that of snobbery. As among the Romans of the Empire, the sexual and sentimental life of the time was a purely physical phenomenon, and, though sincere private affection may be sensed in the lives of the "happy few," the general pursuit of carnal recreation was methodistic, systematic and hard as nails.⁵

In medicine the mania for formal theories and systems of method ran an extraordinary pace, although this century was, financially and socially, the "Golden Age" of both practising physician and quack. Haller, Boerhaave, Stahl, Hoffmann, Cullen, Barthez, Borden, John Brown, had each an artificial "system" or way of looking at disease, all his own, and by which he diagnosed and prescribed for his patients' troubles. Private or secret remedies were the vogue; any formula that "worked" in practice was jealously guarded, as part of the pedestal upon which the physician stood with reference to his particular "theory" of disease. Yet there were clinical advances of extraordinary significance, which can only be appreciated in relation to their modern applications.

Floyer published his "Pulse Watch" in 1707. Martine and Currie introduced clinical thermometry (1740-98). Auenbrugger discovered the art of percussion (1761). The Hahn family introduced the use of the cold pack in fevers and Currie himself gave cold baths in typhoid. Withering introduced digitalis. Galvani, Volta and Franklin furnished the means for electrotherapy. Heberden, Fothergill, Lettsom, Parry, Huxham, Baker and Pringle added to the luster of English medicine by their close notations of new diseases at the bedside. More diseases were accurately described in this period than ever before.

⁴ Of this amusing phase there are endless examples in the waspish antitheses of Pope, e.g.,

"Boastful and rough, your first son is a Squire;
The next a Tradesman, meek and much a liar;
Tom struts a Soldier, open, bold and brave;
Will sneaks a Scriv'ner, an exceeding knave;
Is he a Churchman? then he's fond of power;
A Quaker? sly; a Presbyterian? sour;
A Smart Free-thinker? All things in an hour."

⁵ Litmus tests of this proposition are: the fiction of the entire period, from *Clarissa Harlowe* to *Faublas*; the drama prior to Goldsmith and Sheridan; the moralities in Rousseau; Hogarth, the one realistic artist of the time; the early youth of Frederick the Great and his final phase; the epitaph of Francis Charteris; the *Parc aux Cerfs* and its relation to the French Revolution. It is highly significant that Frederick the Great (certainly no moralist) could have had Russia as his ally in the Seven Years War, had he not dubbed the Czarina "*l'infâme catin du nord*."

Gross pathology became a science at the hands of Morgagni (1761) and Matthew Baillie (1793). Jenner introduced preventive vaccination (1796-98) and first described anaphylaxis (1798). In forwarding the technic of operative surgery France took the lead, even beyond the time of John Hunter, the founder of experimental surgery. The management of obstetric cases was vastly improved by William Hunter, Smellie, Charles White and others. Brisseau, Maître-Jan and Daviel developed our present knowledge of cataract and its treatment. Anatomical illustration in copper and steel attained the heyday of its perfection. The true physiology of respiration (hinging upon the discovery of oxygen) was developed by Black, Priestley, Lavoisier, Laplace and Lagrange (none of them medical men); and the science of blood-pressure owes its origins to Stephen Hales (an English clergyman). Ramazzini wrote the first book on industrial diseases (1700) and Frank the first scientific treatise on public hygiene (1777-78).

In the 18th century the administration of military medicine became a definite function of government, and, in consequence, limited periods of voluntary enlistment, regular medical examination of recruits, regular salaries for officers, government quarters for troops, regular uniforms, a common daily ration, the military regulation of army hospitals, printed orders and bulletins on military paper, periodicals devoted to military medicine, and regular schools of military medicine (in Prussia and Austria) became part of the established order of things.⁶ Thus military medicine profited by the 18th century cult of formal systems and elaborated routine.

Infantry was now armed with fire-arms exclusively, and through the hard cogitations devoted to the art of war by Prince Leopold of Anhalt-Dessau and the Maréchal de Saxe, it acquired great efficiency. Martinet, whose name is synonymous with formal meticulous precision, introduced regularly planned camps (1667), the use of the bayonet (1669), the organization of infantry *cadres* by companies and battalions, pontoon bridges, newer tactical evolutions, etc. Of the elder Dessauer Carlyle observes:⁷ "He invented the iron ramrod; he invented the equal step; in fact, he is the inventor of modern military tactics. . . . The soldiery of every civilized country still receives from this man, on parade-fields and battle-fields, its word of command; out of his rough head proceeded the essential of all that innumerable drill-sergeants, in various languages, daily repeat and enforce."

Of the effect of Frederick's methods of volley-firing at close range upon relief of the wounded, Straub says:⁸

⁶ Limited periods of enlistment, first recommended by the Maréchal de Saxe in 1732, were definitely adopted by Venice in 1766 and by England in 1775. Medical examinations of recruits for militia were customary in France from 1726 to 1775; in England an inspector-general of recruiting for foreign service was appointed in 1778, but there were no regular medical examinations until 1790, and no written attests until 1799. Examinations were first authorized in Germany in the Prussian regulations of 1788. Salaries of medical officers, even of the Prussian surgeons general, were fluctuating, precarious and sometimes non-existent for a long period. Billeting on civilians was prohibited in England in 1745, but persisted elsewhere until late in the century, and was not abolished in Scotland until 1857. Building of barracks began with Vauban in 17th century France, and was started in England in 1739. Uniforms were introduced in France by Louvois (1670-79). The first governmental hospital regulations were French (1718). For specimens of printed government orders see the facsimile reproductions in Cabanes (*Chirurgiens et blessés*, Paris, 1918, *passim*).

⁷ Carlyle: Frederick the Great, Book IV, ch. 2.

⁸ Straub: Medical Service in Campaign, Philadelphia, 1910, 87.

"During the time of Frederick the Great troops advanced into battle, shoulder to shoulder, to within 200 yards of the enemy, and sought to overcome him by superiority of fire; the contestant that could fire most rapidly had the best chance of being successful. Open ground was chosen by preference and the rescue of the wounded during the progress of the engagement was out of the question."

Throughout the 18th century France, in consequence of Louis XIV's campaigns, became the "great nation," and was everywhere regarded as the centric authority in literature, painting, architecture, science, medicine, surgery, etiquette and the art of war.

*Military Medicine in France*⁹

The first important advance made in French military medicine dates from an order of Louis XIV (January 17, 1708), which specifies that, in future, sick and wounded officers and soldiers shall be attended on the march and in hospital by a personnel of 200 physicians and surgeons, previously tried out by appropriate examinations, and consisting of 4 medical inspectors general, 50 advisory physicians major (*médecins-major*) for hospitals, 4 advisory surgical inspectors general, 4 surgeons major of camps and armies and 138 surgeons major. At the same time military hospitals were erected in 51 French cities. Commissions for grades were sold to applicants, but the harmful arrangement was nullified in a royal order of Louis XV (1716). The first hospital regulations, a document of 62 paragraphs, was issued on December 20, 1718, and became the basis of all similar regulations in France. It contains clear and exact directions as to the duties of hospital personnel, medical treatment of patients, hygiene of attendants, administrative control of subaltern functionaries, and prevention of contagious diseases. Yearly courses in anatomy are prescribed for surgeons, and a garden of medicinal herbs is to be attached to each hospital from the date of construction. The making of wills by dying patients in favor of an institution, an order or an interested person is forbidden. An order of 1719 fixes the monthly pay of medical personnel as follows: physician in chief, 500 livres, 10 rations of bread; consulting surgeon, 150 livres, 10 rations; chief surgeon, 390 livres, 6 rations; principal assistant surgeon, 150 livres, 4 rations; sub-assistant surgeon, 60 livres, 3 rations; boy (assistant), 50 livres, 2 rations; chief apothecary, 120 livres, 4 rations; apothecary's boy, 50 livres, 2 rations. In the field chief physicians and surgical consultants got 1,500 livres for their equipment, and a bonus of 2,000 livres at the end of the campaign. These regulations were re-edited, in compressed form, in 1728, and on January 1, 1747, appeared a new royal order, combining the main features of both, and destined to be rescinded and reaffirmed at intervals throughout the century. The principal defect of this new order was the creation of a *Commissariat de guerre (intendance)* to usurp the legitimate functions of medical personnel. While this was ostensibly designed to circumvent speculation by contractors (punishable first by 1,500 livres fine, second by 9 years hard labor in the galleys), it had deplorable consequences for the actual relief of the sick and wounded, even to the end of the Seven Years War, by reason of the fact that the hospitals and ambulances of the first line were financed from the king's privy purse, those of the second line by the *entrepreneurs* or contractors. At the end of the Thirty Years War there appeared a serial designed to advance the interests of military hospitals, edited by Richard de Haut-Sierk, Inspector General of Hospitals, and entitled *Recueil d'observations de médecine des hôpitaux militaires* (1766-72). This was followed by the first periodical

⁹G. Marache: *Dict. encycl. d. sc. méd.* (Dechambre), Paris, 1877, 2. s., VIII, 79-97, Cabanès: *Chirurgiens et blessés à travers l'histoire*, Paris, 1918.

to be devoted to military medicine, viz., the *Journal de médecine militaire* (Paris, 1782-88), which was revived at intervals as a *Recueil* in 1814, 1817 and 1871. During the period 1747-92 there was uninterrupted warfare between the physicians, surgeons and commissariat of war, which manifested itself by many changes in orders. Thus an order of August 4, 1772 prescribes a Commission with exclusive control of the medical personnel, consisting of an inspector general, 5 medical inspectors and 2 surgical ditto. It was rescinded by an order of August 17, 1774 and the old arrangement of January 1, 1747 was resumed. A royal order of 1775 authorizes the opening of lecture rooms for instruction in military medicine in the hospitals of Metz, Lille and Strassburg. This, the first attempt at an army medical school, had later developments at Brest and Toulon. In spite of this advance the status of medical officers was still feudal. Louvois, the great minister of Louis XIV, and creator of the royal "standing army," endeavored to overthrow the proprietary system of mercenary forces (each regiment for hire and the exclusive property of its colonel) by giving wealthy young nobles the empty title of "colonel," or "captain," while the real work was done by lieutenant colonels or lieutenants. By this arrangement commissions and regiments could no longer be bought, but the result was a commissioned force of juvenile officers of high grade which blocked promotions for a lifetime, while chief physicians or surgeons were still arbitrarily selected as vassals by these swaggering young courtiers. The educational order of 1775 was again abolished on January 1, 1780 as incurring unnecessary expense to the state. In 1788 regimental hospitals were substituted for the general military hospitals in vogue, with a host of new instructions and regulations. An order of May 18, 1788 embarked upon the dubious course of assigning control of military hospitals to a directorate made up of military and medico-military members, with a sanitary council (*Conseil de santé*) as adjunct. But before this (with three subsequent modifications) could be tried out by test, the whole edifice was swept away by the French Revolution (1789). The first act of the Constitutional Assembly was to abolish, in 1790, an edict of 1781 by which commissioned rank had been reserved for the aristocracy alone. This put new blood into the artillery and engineer schools, and from this class came Napoleon and some of his best generals. The Republic declared war on Austria on April 20, 1792. The armies created for this purpose by the revolutionary general Carnot, first by enthusiasm, later by remorseless conscription, were destined to raise the military reputation of France to the highest point and, under Napoleon, to obliterate the older 18th century plan of making war by set principles and mechanical rules. At first whole columns of the Republican troops melted away under the steady fire of disciplined regulars, but the gaps in the ranks were speedily filled up, and no headway could be made against a "nation in arms" animated by ferocious patriotism. In contrast with previous wars there were few desertions, since each private was also a patriot and had a fanatical personal interest in the cause. At the outbreak of the war 1,400 physicians and surgeons applied for entrance to the army, and many of these were lost by wounds or disease. By the law of August 1, 1793 the National Convention placed all physicians, surgeons and apothecaries at the disposal of the Minister of War. In January, 1793 2,570 medical officers had been raised; by the end of the year there were 4,000; in 1794 a maximum of 8,000 was attained. Meanwhile, in 1792, the 18 medical faculties and 15 medical schools of France had been abolished by vote, along with the *Académie de chirurgie* and the *Société royale de médecine*. In 1794 *Écoles de santé* or schools of military medicine, with the graduating degree of *officier de santé*, were created, in order to supply medical officers for the armies of the Republic. The effect of this device of mob rule (always fatal to medicine) was chaotic. Medical education could have no firm grounding nor any definite course under such an arrangement. Training was superficial, practice was thrown open to anyone who could pay for a license. An

actual specimen examination of a candidate of 1803, exhumed by Wickersheimer,¹⁰ displays appalling ignorance. The evil was eventually checked by the firm hand of the First Consul, who restored the medical faculties to their proper status in 1804.

The principal wars of this century were the wars of the Spanish (1701-13), Austrian (1740-48) and Bavarian Successions (1778-79), the Seven Years War (1756-63) and the three revolutions in Russia (1773), America (1775-80) and France (1789-94).

War of the Spanish Succession

In 1700 Charles II of Spain died and his successor was Philip of Anjou, grandson of Louis XIV. The view of the Grand Monarque that France and Spain were now one (*Il n'y a plus de Pyrénées*) brought about an alliance of England and Holland against him under such overtopping leaders as Marlborough, the greatest English commander before Wellington, and the redoubtable Prince Eugene of Savoy. But after thirteen years fighting, with the memorable battles of Blenheim (1704), Ramillies (1706), Oudenarde (1708) and Malplaquet (1709) as victories for the Allies, the whole aspect of the question was changed by the succession of Archduke Charles of Austria to the throne of the Central Empire. This brought about a more dangerous possibility for Spain and thus left the Bourbon prince on the throne with a dissolution of the Alliance, set off by the acquisition of Gibraltar, Newfoundland, Nova Scotia and the Hudson Bay territory by England and of Milan, Naples, Sardinia and the Spanish Netherlands by Austria. The English forces numbered 40,000 out of a population of 10,000,000, and the French 200,000 out of 20,000,000. These forces were recruited by voluntary enlistment in France and partly by impressment in England, but poverty was the great recruiter of armies at this time. Louis XIV observed that "hunger would compel his subjects to follow the bread-wagons." Troops on both sides suffered great hardships from the barren condition of the countryside. The English forces were therefore followed by trains of bread-wagons and cattle. In his thoughtful consideration for the health and well-being of his men, Marlborough was equalled only by Frederick the Great.

The introduction of a rhythmic, cadenced or metronomic step in marching exerted a profound effect on discipline and *esprit de corps* and enabled infantry to get over great distances without undue fatigue. Marlborough's celebrated march to the battlefield of Blenheim, covering 1,176 miles in 86 days, was accomplished by continuous movement during the cool morning hours (3-9 A. M.) toward a definite halting place, prepared and

¹⁰ E. Wickersheimer: *Paris méd.*, 1912-13, suppl., 749-851. Translation in *Jour. Am. Med. Assoc.*, Chicago, 1913, LXI, 2001. This affords an amusing, yet dreadful example of the flippancy and irresponsibility of popular rulings in regard to a subject so grave and difficult as medicine.

rationed in advance by commissaries, and where the rest of the day was spent in rest. The result was that his troops looked, in the phrase of the Elector of Prussia, "as if dressed for a ball." Marlborough did everything he could to discourage intemperance and debauchery in camp, tried to impress his men with a sense of morale and self-direction, held divine service morning and evening, read prayers before and after battle, by which and similar means, his camp "resembled a well governed city." Before the action at Blenheim he took pains to have the surgeons shown the exact places for assemblage and care of the wounded. After the victory, he wrote to Godolphin: "I have been so employed about our own wounded men and prisoners that I have not had one hour's quiet." At the beginning of the campaign it had been promulgated in the British Articles of War that one day's pay be deducted annually for the hospital, and that all plunder taken before the end of a battle be forfeited for the use of the sick and wounded, and that one-tenth of the total spoils be set apart for the same purpose. The losses in the four great battles of this war were heavy, viz.,

1704—Blenheim: Allies, 5,000 killed, 8,000 wounded; British, 670 killed, 1,500 wounded; French and Bavarians, 12,000 killed, 14,000 wounded, 14,000 missing.

1706—Ramillies: Allies, 1,066 killed, 2,867 wounded; French, 2,000 killed, 5,000 wounded, 6,000 missing.

1708—Oudenarde: Allies, 3,000 killed and wounded; French, 6,000 killed and wounded, 9,000 prisoners.

1709—Malplaquet: Allies, 20,000–30,000 killed, wounded and missing (Infantry, 5,554 killed; 12,706 wounded and missing); French, 6,000–16,000 killed, wounded and missing.

In all these actions Marlborough shone as a great commander through his zeal for relief of the wounded. At Malplaquet evacuation of the wounded and burial of the dead occupied two days. At Oudenarde he broke the stereotyped rules of the "art of war" by forcing his tired troops, with their backs to a river, to destroy the enemy's right and centre under his very eyes. After nightfall the field was covered with wounded, mixed with the dead and dying, and here again, Marlborough's ingenuity was taxed to the uttermost. Malplaquet he described as "a very murdering battle," for here thousands of his old comrades were destroyed. In these battles it was sometimes necessary to break up the commissary wagons to make litters for the wounded.

*Development of Military Medicine in Prussia*¹¹

Until the time of Frederick the Great the medical service of the Brandenburg armies remained on the 17th century level, with little evidence of the governmental supervision which had become a fixed principle in France after January 1, 1747.

Under Friedrich I, the first king of Prussia (1688–1713), company barbers were first subordinated to the regimental barber (order of November 4, 1712). Examinations to test the fitness of the latter had not been instituted before 1685. An order of November 4, 1712 authorizes the regimental barbers to choose and pay field barbers and to procure medicines. The first order for the location of appropriate sites for military hospitals was promulgated on March 10, 1704. The first regular military hospital in Prussia was a house near the Spandau gate (Berlin), set apart for the plague in 1710, and which was incorporated as the Charité by a royal order of September 5, 1725.

Under Friedrich Wilhelm I (1710–40) an order of May 18, 1713 specifies that regi-

¹¹ E. Knorr: *op. cit.*, 73–92. A. Koehler: *Veröffentl. a. d. Geb. d. Mil. San., Wesens. Berl.*, 1899, Heft 13, 23–41; 129–262.

mental barbers shall have the rank and pay of subaltern regimental officers (a considerable advance in their then status), and shortly after his accession the monarch nominated the regimental surgeon of his guard, J. C. G. Brandhorst (1694–1740), to be general surgeon (*Generalchirurgus*) of the guard at a salary of 15 reichsthaler monthly. During 1716–19 Brandhorst, Bouness and Cassebohm were sent to Paris to study. The first Surgeon General of the Prussian Army was Ernst Conrad Holtzendorff (1688–1751), who received this honor in 1716. His success in treating the king during a grave illness in 1719 won the royal confidence, and through this circumstance the *Theatrum Anatomicum* (founded 1713) was expanded to include the *Collegium medico-chirurgicum*, for the higher instruction of medical officers, on January 3, 1724; and medical officers were sent to France and elsewhere to complete their medical studies, at government expense. In 1734 the king was gravely ill with gout and dropsy. In gratitude for the skillful handling of his case by Eller and other physicians he presented 100,000 thaler to the Charité.

In the reign of Friedrich Wilhelm I the Prussian army had increased from 30,000 to 76,000–89,000 men. The intense personal interest of this king in the medical corps is indicated by his instructions to the Surgeon General of January 30, 1725:

1. In the future no regimental barber will be accepted or dismissed without prior knowledge of the king.

2. The applicant must appear before the Surgeon General; he must pass an examination before the *Collegium medicum* on his knowledge of internal diseases and absolve a course in operative surgery.

3. He must subscribe to his oath at the hands of the regimental auditor in the presence of the commanding officer.

4. In the cavalry his pay will be 106 thaler monthly, of which he must disburse 6 thaler to the barber of each squadron (10 in all) and pay for outfitting the field-chest and instruments. In the infantry he receives 12 thaler monthly from the staff and 10 thaler monthly from each company, out of which (latter) amount, he must maintain the company barber at 5 thaler monthly and disburse the remaining 5 thaler for medicines. The field-barbers are subordinated to him and can treat no patients without his knowledge and consent. In detached companies their status is independent. Their duty is to shave the soldiers and to visit the sick.

5. The regimental barber will report to the commanding officer daily at 11 a. m. and at other hours in urgent cases.

6. In cases of death he must conduct the post-mortem section in the presence of an officer, handing in his report, with summary, to the commanding officer.

7. The commanding officer will hand in a personal report to the King.

(A supplementary order of December 24, 1726 adds: Regimental-barbers but not field-barbers shall be allowed to practice internal medicine and surgery among the civilian population, and to write prescriptions in apothecary shops; their evidence on bedside and post-mortem data shall be accepted in court.)

The Infantry Regulations of March 1, 1726 specify the old rule of the Brandenburg Army that no relief of the wounded could be attempted until victory had been sounded by the trumpets: "When the battle is over, each regiment shall seek out its wounded and bring them to a definite place where they can be bandaged and cared for; no wounded may be removed during battle." That this rule was not strictly in force is evidenced by the fact that Schmucker was wounded at Soor (1745) and Prague (1761) in line of duty. The same Instructions specify that "A military hospital shall be erected in the nearest town, to which the sick will be sent with a captain, a barber and two attendants from each battalion; should the army move on, a trusty non-commissioned officer shall be detached from each regiment, and supplied with money for the care of the patients.

The patients will receive medicines from the field-apothecary who remains behind for the purpose. They are to be treated in hospital by special barbers, the troop-barbers having only to send patients to the hospital. The slightly sick may be transported by the baggage wagons but never within the marching columns. They are in charge of the captain who is personally responsible and must supply cooked food and bed covers (8 per tent). The barber must never leave his company on the march, he is responsible for the light sick and receives the necessary medicines from the regimental barber. The latter receives from each company 200 *Reichsthaler* and fodder for 4 horses. Barbers are overseered by the Physician and the Surgeon General." In the same year (1726) the "medical-penny" (*Medizin-Grosschen*) was ordered to be deducted from the soldier's monthly pay for the use of the regimental barber, a species of tipping which was strongly disliked, as leading to peculation. An order of 1734 authorizes the construction of a great camp hospital for 600 patients.

Frederick the Great

Friedrich Wilhelm I was thus the creator of the military establishment which was to accomplish such remarkable things under his son, Frederick the Great. The father, a typical Prussian bear of the old régime, was practically in the hands of the Austrian envoy, Seckendorf, who broke up the queen's "double-marriage" project of an alliance with England by holding out to the king an illusory promise of the succession of the duchy of Jülich and Berg. In consequence of this imbroglia the son and his sister Wilhelmine were treated by their father with a cruelty and barbarity which surpasses anything of the kind in history. As Frederick's life was more than once endangered by the parental rigors, he learned early to dissemble. There can be no doubt that, when he came to the throne, he had one definite object in view, to break the power of Austria and of the old Empire. The death of the Emperor Charles and the accession of Maria Theresa gave him his opportunity, and with scarce a word of warning he marched upon Glogau. The rich province of Silesia was easily acquired "by gentle pressure," for the native population favored the conqueror, much as the Milanese population favored Napoleon when his entry into that city destroyed the power of the Spanish viceroys. But Silesia once acquired, it was another matter to hold it. In the first and second Silesian campaigns (1740-45) Frederick served his apprenticeship in the art of war and secured for himself his conquests and a peace of ten years' duration (1748). Meanwhile Maria Theresa occupied herself in mobilizing against him an unheard-of alliance consisting of Austria, France, Russia, Poland, Saxony and Sweden. In the Seven Years War (1756-63) Frederick, as Carlyle puts it, found "his world of enemies all come." The interest of his career at this point is that, however unscrupulous his acquisition of Silesia in the first instance and although in no sense a soldier by original inclination, he succeeded,

with no ally except England (in West Prussia), in keeping this world of enemies at bay with a valor and dexterity never equalled before or since.

His principle of action was extreme rapidity of movement and a vigorous offensive. At Kolin (1757), Grossjägersdorf (1757), Hochkirch (1758) and Kunersdorf (1759) he weathered disasters any one of which would have ended an ordinary commander. Reassembling new forces with extraordinary perseverance, changing base and front with a swiftness which Macaulay has likened to "the desperate bounds of a hunted tiger," he defeated the French, Austrians and Russians successively in the battles of Rossbach (1757), Leuthen (1757), Zorndorf (1758), Liegnitz (1760) and Torgau (1760). The year 1761 found him facing ruin and at the end of his resources, when the death of the Czarina Elizabeth made the Russians allies instead of enemies. With these reënforcements he was able to conquer Silesia and end the war. The remaining twenty-three years of his life (1763-86) were spent in repairing the shattered remains of his kingdom.

The man to whom all this happened was a child of his time and, like others of his time, a bundle of strange contradictions. Through his mother he was partly of French extraction, educated by French refugees in Berlin, French in his tastes and inclinations. His conception of government is summed up in his famous sentence: "The prince is not the absolute master, but only the first servant of his people," and it was through his fidelity to this program, as well as his competence in grappling with his evil star, that he was accounted "the great"—*le grand Frédéric*. Carlyle called him "the last of kings"; on his own showing he was the earliest public servant to give whole-time duty to the interests of a nation.

Frederick's success in arms was due to his capacity for forming swift decisions and acting upon them; partly to the fact that he was his own self-constituted cabinet, general staff and council of war and held all the reins of government. In his day the "art of war" consisted, not of principles but of cut and dried rules, and success was held to depend not upon men but upon methods; able commanders were therefore hampered by rules as well as by subordination to higher authority. Frederick's own rule of "vigorous offensive" cost him dear at Prague and failed him completely at Kolin and Kunersdorf. The end of the second Silesian campaign, which had used up the flower of his fine army, left him with a definite aversion to the costliness and uncertainty of war. The Seven Years War, fought at the end with inferior troops recruited by force from conquered regions, left him warped, hardened and embittered, with a clear vista of the long distance travelled between his spoiled, unsatisfactory youth and the chill isolation of a mean old age, as depicted in his droll verses:

"Un vieillard glacé par les ans,
Froid, taciturne et phlegmatique,
Dont le propos soporifique
Fait bâiller tous les assistants."

From his youthful days at Reinsburg, where he reported daily to his harsh parent about the health of his command, to his order issued one month before his death for a complete inspection of military hospitals, Frederick was perhaps the most active of all great soldiers in forwarding medical administration. His regard for medicine and physicians was small due to the fact that he got little relief from the

many bodily ills that tormented him all his working life.¹² But he saw clearly that to waste men was to court defeat, since for an army fighting in four separate theaters of war defeat always meant ravaging of his thinly guarded zone of the interior by hostile forces.—

“En père bienfaisant conduisez votre armée, . . .
Tant que Mars le permet il faut les ménager.”

He usually made his own dispositions for the location of field dressing stations and general hospitals (in neighboring towns) and was merciless in reprimand if his orders were not obeyed to the letter. Thus at his instance Cothenius organized the field medical service for the Seven Years War with stationary general hospitals at Breslau, Glogau, Stettin, Dresden, Torgau and Wittenberg, field hospitals (*hospitaux ambulants*) within call, and dressing stations, to be protected from enemy fire by locating them behind some convenient hillock or withinside a ditch, at the rear of the fighting columns. In siege operations a board booth or *Blessirten-Depot* was erected at the entrances to the breastworks, with standards one foot high for the imposition of litters; first aid was given by a regimental barber and four company barbers. Detachments for evacuation of the wounded from the field were always made from the regiments which had suffered most in battle (Instructions of 1748). Frederick's rule was first to relieve his own wounded, then those of the enemy, to whom he seems to have been most humane in his earlier campaigns. Thus after Hohenfriedberg he sent Lesser, Bouness, the field apothecary and 50 hospital surgeons to relieve the 7,000 Austrian and Saxon wounded at Striegau and visited them himself on June 5, 1741. After Mollwitz concern for the wounded kept him 11 days at Ohlau. After Liegnitz, 500 dragoons were required to dismount to give saddle transportation to the wounded. On the bloody field of Kunersdorf Frederick ordered rescue and bandaging of the wounded even before the end of the battle. As he was much given to doctoring on his own account, he insisted that his troops be purged and bled at intervals, treated dysentery with tartar emetic and ordered the use of vinegar in

¹² These were: gout, haemorrhoids, constipation, indigestion, asthma and the sequels of venereal and malarial infections. Like many people of small physique he was immoderately fond of the pleasures of the table and usually ignored the dietetic counsels of physicians, probably because the gouty diathesis persisted even during abstemious periods. His menu cards at Sans Souci were of portentous length and variety. Another great handicap for a general in the field was his emotional temperament. He was an exquisite musician, esteemed even today as a composer of chamber-music, turned out yards of indifferent French verses and was profoundly shaken by the deaths of near relatives. With this exaggerated sensibility he ran the gamut of such tremendous emotional experiences as the victory at Leuthen and the reverses of 1759–60. In time of peace, he was on duty from 4 to 5 a. m. until nightfall. His exertions over state-papers and drilling troops were, in Macaulay's phrase, “such as are hardly to be expected from a human body or a human mind.” After death the body had shrunk to infantile proportions.

water on marches in hot weather. In 1746 he presented 40,000 thaler to the Charité; founded the *Invalidenhaus* for instruction of medical pensioners or cadets in 1748; increased the number of garrison hospitals (1765) and the number of pensioner-surgeons, from 9 to 16 (1779). In July, 1786 one month before his death, he ordered a thoroughgoing inspection of all military hospitals, with a view to reorganization and better luck for the wounded. This reform was carried into effect during the reign of his successor, Friedrich Wilhelm II (1786-97).

The Prussian Surgeons General

In 1716 Holtzendorff was appointed Surgeon General, body-physician to the king and "director of all surgeons in the Prussian lands." Eight years later (1724) Johann Theodor Eller (1689-1760), a skilled physician and chemist, was appointed Field Physician in Chief, presiding over all physicians (*medici*) and general medical practice in the army, as Holtzendorff presided over surgery and sanitation. This dual arrangement, effect of the old-time divorce between medicine and surgery, was yet regarded as a distinct advance for surgery, since surgeons now received the same training as physicians. It persisted throughout the 18th century, but was put to no particular test of merit until the first Silesian war. While obviously faulty, as tending to decentralize administration, it could have had little effect either way in Frederick's campaigns, for the latter himself made all dispositions for relief of the wounded, location of hospitals, etc., in his battle-orders. In 1746-7 J. H. Bouness was appointed to succeed Holtzendorff as Surgeon General, and after serving through the earlier period of the Seven Years War, died in 1758. About the same time (1757-8) Eller, the Physician in Chief, was found to be incapacitated for service in this campaign by age and Christian Andreas Cothenius (1708-89) was appointed General Field Staff Physician (*Generalfeldstabsarzt*), with Ludolf (1757-63)¹³ and Zinzendor (1763-89) as subalterns. Some-time before Bouness' death, and on account of enlargement of the army and the fact that separate detachments were fighting in several theaters of war, the king appointed Johann Leberecht Schmucker (1712-86) and Johann Ulrich von Bilguer (1720-96) as second and third surgeons general. Upon Bouness' death (1758) Schmucker, Bilguer and J. A. T. Theden (1714-97) became first, second and third surgeons general respectively. When Schmucker died (1786) the arrangement became 1. Theden, 2. Bilguer and 3. J. C. F. Voitus. When Bilguer died (1796) it became 1. Theden, 2. Mursinna, 3. Johannes Goercke (1750-1822). Finally when Theden died (1797) Goercke was appointed Chief of Military Sanitation and General Staff Surgeon, thus presiding over all medical, surgical and sanitary administration. Under Goercke the Collegium Medico-Chirurgicum became, in 1795, the Medico-Chirurgical Pepinière, otherwise known as the Friedrich Wilhelms Institut, and after 1895, the Kaiser-Wilhelms Akademie. In 1798 a similar Collegium Medico-Chirurgicum had been established for the Saxon Army at Dresden, and in 1785 the Josephinum, or Medico-Chirurgical Academy of the Austrian Army, was established at Vienna. The arduous labors of the Prussian surgeons general in relief of the wounded in the different battles are given in detail by Koehler.¹³ Holtzendorff was instrumental in the foundation and extension of the Army medical college. Cothenius organized the field medical service for the Seven Years War, including the hospitals and the medicine chests. Schmucker, who was badly wounded

¹³ Koehler: *op. cit.*, 129-218. Bilguer managed the care and treatment of the wounded at Rossbach, Leuthen, Kunersdorf and Torgau. Of the battle of Torgau he reports that out of 6,618 severely wounded, he lost only 653, while 5,557 recovered and 408 were invalided.

at Soor (1745) and Prague (1761), acquired an extraordinary experience in military surgery in all the battles of the Silesian and Seven Years Wars, of which he has left a record in his valuable collections of surgical cases (1774-82). These include a successful mastoid operation by staff-surgeon Jasser (1776). Bilguer achieved a European reputation through his dissertation of 1761 against reckless and ill-considered amputation, the bane of French surgery, then dominant. He was supported in his contention by the most eminent authorities of his time, and thus became the father of the conservative orthopedic surgery of Syme, Fergusson and Brodie. Theden wrote several books on military surgery, invented and manufactured elastic catheters and canulas, was a pioneer in hydrotherapy, invented a method of ventilation and introduced compressive bandaging. Goercke reorganized the Prussian Army medical department, and is essentially a figure of the Napoleonic period in energy and enterprise.

The likenesses of all these officers in gala uniform or court dress have been preserved, either in the oil-portraits by Pesne and other court-painters of the period, or in the etchings and engravings of Chodowiecki and Moehsen. Holtzendorff and Cothenius are typical 18th century men, with bold eyes and prominent features, like Händel or Hogarth. Eller, Theden and Goercke have something of the finesse which we associate with William Hunter or Benjamin Rush. Bilguer looks frosty and disagreeable and was, in fact, unpopular and ignored, while Theden's jubilee lasted five days. With the exception of Bouness, who may have had some Gallic infusion, all have the preternatural gravity of the Northern races.

Battle-losses in Frederick's Campaigns

As given by Carlyle, and others the losses in the principal battles of the first and second Silesian wars were as follows:

Mollwitz (April 10, 1741): Prussians, 4,613; Austrians, 4,410 (killed, wounded and missing).

Chotusitz (May 17, 1742): Prussians, 5,000 (1,905 killed); Austrians, 7,000 (1,052 killed).

Hohenfriedberg (June 4, 1745): Prussians, 5,000; Austrians and Saxons, 9,000 and 7,000 taken prisoners (Saxons, 33 officers, 2,419 men killed; 90 officers, 825 men wounded).

Soor (September 30, 1745): Prussians, 1,500 killed, 3,000 wounded out of 18,000; Saxons, 27 killed, 474 wounded.

Kesselsdorf (December 15, 1745): Prussians, 1,604 killed, 3,158 wounded; Saxons, 58 officers, 3,752 men killed and wounded.

In the Seven Years War the Prussians suffered 8 defeats out of 16 major battles and lost 190,000 soldiers out of 218,000 and 33,000 of the native population. Their allies, the English, lost 100,000, the Austrians, 140,000, the Russians 120,000, the French 200,000, the Swedes 25,000 and the armies of the old Empire 20,000. The losses in the principal battles were:

Lobositz (October 1, 1756): Prussians, 3,308; Austrians, 2,984.

Prague (May 6, 1757): Prussians, 11,740 killed and wounded, 1,560 prisoners (10.80 per cent total strength); Austrians, 10,000 (14.8 per cent) and 4,275 prisoners.

Kolin (June 18, 1757): Prussians, 6,710 killed and wounded (including 326 officers) and 5,380 prisoners out of 34,000; Austrians, 8,000 (including 1,500 prisoners) out of 53,500.

Grossjagersdorf (August 30, 1757): Prussians, 3,000; Russians, 9,000.

Rosbach (November 5, 1757): Prussians, 165 killed, 376 wounded; Austrians and French (French, 3,650 killed and wounded, 6,220 prisoners).

Leuthen (December 5, 1757): Prussians, 1,141 killed, 5,118 wounded, 85 prisoners out of 30,000; Austrians, 3,000 killed, 7,000 wounded, 12,000 prisoners out of 80,000.

Zorndorf (August 25, 1758): Prussians, 11,385 (3,680 killed) out of 36,000; Russians, 21,529 (6,406 killed, 11,867 wounded) out of 42,000.

Hochkirch (October 14, 1758): Prussians, 9,450 (1,190 killed and missing, 5,381 wounded); Austrians, 8,614 killed, wounded and missing.

Kunersdorf (October 10, 1759): Prussians, 20,720 (48.2 per cent) out of 43,000; Austrians and Russians, 15,700 out of 90,000 (Russians, 2,614 killed, 10,863 wounded).

Liegnitz (August 15, 1760): Austrians, 10,000; Prussians, 1,800.

Torgau (November 3, 1760): Prussians, 13,120 (30 per cent) out of 44,000; Austrians, 11,260 (17.3 per cent) out of 65,000.

War of the Austrian Succession

(1740-48)

The breach made by Frederick the Great in the fabric of the Holy Roman Empire soon set the whole world by the ears. Nearly all the great powers began to cavil at the doctrine of Pragmatic Succession, i.e., the right of Maria Theresa to the imperial throne. In the War of the Austrian Succession (1740-48), which ostensibly challenged this doctrine but actually aimed at the destruction of the old Austrian Empire, there was fighting all over the globe. For this cause, as Macaulay said, the wild Highlanders fell at Culloden, the devoted column at Fontenoy was destroyed, "black men fought on the coast of Coromandel and red men scalped each other by the Great Lakes of North America." The peace of Aix la Chapelle (1748) left Silesia in the hands of Frederick.

The first five years of the War of the Austrian Succession were occupied mainly with Frederick's first and second Silesian Campaigns. During this war England sided with Maria Theresa, as it was to side with Frederick in the Seven Years War. In the interval between the two Silesian wars an English army under George II entered Germany and defeated the French at the battle of Dettingen on June 27, 1743. Frederick abandoned the French who, although driven out of Austria, defeated the Austrians, English, Dutch and Hanoverians at Fontenoy on May 11, 1745. A remarkable feature of this war was guerilla raiding and bushwhacking by hordes of murderous Croats, Hungarian Pandours (Tolpatches) and huzzars. These "Pandourades" spread lawlessness and rapine through whole kingdoms and were bitterly resented by the people.

At the battle of Dettingen there was present a keen-sighted Scotch officer who, through the Earl of Stair, brought about an agreement with the Duc de Noailles that both the French and English military hospitals were to be regarded as neutral and immune from attack during the

engagement. This was Sir John Pringle (1707–82), who had been made Surgeon General of the British Army one year before (1742) and served in that capacity until 1758. Pringle's account of this temporary Red Cross agreement may be given in his own words:

"Till then it had been unusual for the security of the sick (when the enemy was near) to remove them a great way from the camp; whereby many were actually lost before they came under the care of the physicians. But the Earl of Stair, my illustrious patron, being sensible of this evil, when the army was encamped at Aschaffenburg, proposed to the Duke de Noailles (of whose humanity he was well assured) that the hospitals on both sides should be considered as sanctuaries for the sick, and mutually protected. This was readily agreed to by the French General, who took the first opportunity to show a proper regard to his engagement. For when, after the battle of Dettingen, our hospital was at Feckenheim, a village upon the Maine, at a distance from the camp, the Duke de Noailles, having occasion to send a detachment to another village, upon the opposite bank, and apprehending that this might alarm the sick, he sent to acquaint them, that, as he knew the British hospital was there, he had given express orders to his troops not to disturb them. This agreement was strictly observed on both sides during the campaign, and though it has been since neglected, yet it is still to be hoped that on future occasions the contending parties will make it a precedent."¹⁴

In 1752 Pringle published his *Observations on Diseases of the Army*, the most important text-book on military medicine of the time, in which are laid down the true principles of military sanitation and the ventilation of hospital wards. Pringle was one of the pioneers of the antiseptic idea, showed that jail fever and hospital fever are one and the same, did much for the better ventilation of ships, barracks, jails and mines, correlated the different forms of dysentery and gave the name influenza to that dread disease. This work, the source-book of all subsequent writers, was followed by Van Swieten's book on *Camp Diseases* (1758) and Richard Brocklesby's *Observations on Military Hospitals* (1764). In the Navy, James Lind's *Essay on the Hygiene of the Sailors* (1757) became a classic, especially in relation to the prevention of scurvy.

The siege of Metz (1552) and the battle of Dettingen (1743) were by no means the only instances of a temporary Red Cross agreement. No less than five, between 1743 and 1864, were placarded at the Berlin exposition of military medicine in 1914.

During the early part of the century constant attempts were made to arrange some disposition of the wounded which would not interfere with military operations. At the battle of Fontenoy (1745) the wounded were treated on the front line by regimental surgeons, then collected at ambulance stations, where major operations were performed, and finally evacuated to hospitals in cities farther back, an almost perfect system.

¹⁴ Pringle: *Observations on the Diseases of the Army*, London, 1752, preface, pp. viii-ix.

Heizmann's account of this important episode¹⁵ may be quoted in full:

"The contending forces, allied English, Dutch, Hanoverians and Austrians, 55,000, and the French, 60,000, were organized very much alike: foot battalions of five companies containing 100 to 140 men each, two to four battalions making a regiment numbering 1,000 to 2,700 men, the English battalions being slightly largest; cavalry, in squadrons of about 100 men each. As at this time each infantry regiment had a surgeon and mate or assistant, it is estimated that the Allies had about forty regimental medical officers, the French as many; the cavalry of both armies had none. There was on both sides a small number of physicians, one usually to a garrison of about 10,000 men, and army surgeons. The infantry were armed with flintlock muskets and bayonets, the sword having been abandoned about this time, and they worked the fieldpieces of artillery, the largest mentioned being a battery of six 16-pounders on the bank of the River Scheldt opposite the field, to cover the retreat of the French King. All arms were engaged at one time or another, the artillery opening the battle, and at the critical moment, supported by cavalry, saving the day for the French, an occurrence said to have been the first combination of the two arms in history.

With the village of Fontenoy toward the right of the French centre, the length of the line that bore the brunt of the battle was about 1,200 yards, and the width, of what was practically a closed field, was 2,000 yards. The point where the English and Hanoverians massed their attack was on the left of the village, including it eventually, and it was here that the terrible slaughter of the French infantry nearly won a victory for the allies. Surgeons were posted on the first line, as is proved by the fact that while the English were advancing on the regiment stationed nearest Fontenoy, the French lieutenant-general Luttaux was wounded, and his aide implored him to have his wound first dressed before going to report to the king. The regiments of Hainaut and Dillon were, in the beginning, on the French left, and which, moving toward the centre to stay the English by an attack in the flank, lost heavily. It is stated by Boucher that on the field itself amputations were performed on wounded of these regiments, it is inferred, at the ambulance hospitals, which were, at the farthest, about 2,000 yards from the front line. After the battle these ambulances were evacuated and the wounded carried on caissons and carts to cities in the rear, principally to Lille, 16 miles, and Douai, 20 miles distant, where an immense number of surgical operations were performed at hospitals established for the purpose, the civil hospitals, churches and private houses being used. A battle begun with an exchange of fencing master's compliments ought to have terminated by an exhibition of practical philanthropy, and Voltaire says that in these hospitals no comfort was wanting for the wounded French or their prisoners. The zeal of civilians and soldiers was such that the surgeons were obliged to interfere, and the hospitals were so well managed that officers preferred to be treated there. The Allies carried 600 wounded twenty miles, to Ath, where a hospital was established in the casernes; they left 1,200 in the hands of the French, who had of their own 4,000. Here, then, at Fontenoy May 11, 1745 wounded soldiers were treated on the first line by regimental surgeons; they were collected at ambulance stations where capital operations were performed, then transferred to hospitals prepared for them in near cities and, when these became overcrowded, to cities farther away. A few months after this battle Maillebois conducted an army into Italy, his chief physician being Baron who was subsequently dean of the Faculty of Paris, and in nearly every daily order for marching and camping is designated a place for the hospital *ambulant*, usually on the march in rear of the artillery with the treasure and provisions. The day before the battle of Bassignano, September 27, 1745, three ambulance hospitals were

¹⁵ Heizmann: Ann. Med. History, N. Y., 1917-18, I, 299-300.

organized, one for each column, and ordered to take station at villages, each about 1,200 yards in rear of the line of battle on the river Tanaro where an engagement was expected. Two of these hospitals actually united opposite the centre of the line which covered ground about 6,000 yards long. And in the "Art of War," by the Maréchal de Puysegur, published in 1749, a map for illustration shows the ambulance about 2,500 yards in rear of the first line. Excepting an untried project of Ravaton very little improvement on Randby's outline and Bagieu's account took place subsequently until Larry and Percy made their names immortal, not only for the invention of details to rapidly relieve and remove wounded soldiers during battle on a scale never equalled, but for their inestimable contributions to operative military surgery."

Among the surgeons' mates on the naval expedition of Admiral Vernon to Carthagen (1741) was the Scotch novelist Tobias Smollett (1721-77), who gives the following account of the status of the sick and wounded who survived the storming of Fort Lazar¹⁶:

"As for the sick and wounded, they were next day sent on board the transports and vessels called hospital-ships; where they languished in want of every necessary comfort and accommodation. They were destitute of surgeons, nurses, cooks and proper provision; they were pent-up between decks in small vessels where they had not room to sit upright; they wallowed in filth; myriads of maggots were hatched in the putrefaction of their sores, which had no other dressing than that of being washed by themselves with their own allowance of brandy; and nothing was heard but groans, lamentations and the language of despair, invoking death to deliver them from their miseries. What served to encourage this despondence was the prospect of those poor wretches who had strength and opportunity to look around them; for there they beheld the naked bodies of their fellow-soldiers and comrades floating up and down the harbour, affording prey to the carrion-crows and sharks which tore them in pieces without interruption, and contributing by their stench to the mortality that prevailed.

"This picture cannot fail to be shocking to the humane reader, especially when he is informed that while those miserable objects cried in vain for assistance, and actually perished for want of proper attendance, every ship of war in the fleet could have spared a couple of surgeons for their relief; and many young gentlemen of that profession solicited their captains in vain for leave to go and administer help to the sick and wounded. The necessities of the poor people were well known; the remedy was easy and apparent; but the discord between the chiefs was inflamed to such a degree of diabolical rancour that the one chose rather to see his men perish than ask help of the other, who disdained to offer his assistance unasked, though it might have saved the lives of his fellow-subjects."

War of the Bavarian Succession (1778-79)

In 1777 Maximilian Joseph, Elector of Bavaria, died without issue. The disputes about the succession following this event and the fact that Emperor Joseph II of Austria assumed possession of the Elector's lands occasioned a brief war, into which the aged Frederick the Great was reluctantly drawn. In July, 1778 he crossed the Bohemian border at the head of an army of 100,000 men, but there was no fighting of consequence and the difficulties were resolved by the treaty of Teschen

¹⁶ Smollett: *Miscellaneous Works*, Edinburgh, 1806, IV, 445-469. Cited by Carlyle.

(May 13, 1779). The principal interest of this brief campaign is that almost for the first time Frederick's forces suffered materially from disease, with an enormous mortality from dysentery and typhus fever. Of his first Silesian army he lost by disease 9,300 men; of the second, numbering 69,113, 5,200 died in six months, while the Saxon army of 22,000 lost only 48 in the same period. Frederick brooded long over these losses and on July 10, 1786 he instructed staff surgeon J. G. Fritze to make a thorough inspection and critique of Prussian military hospitals, resulting in Theden's Regulation of September 16, 1787 which remained in force up to the Instructions of October 2-3, 1809.

Military Surgery in the 18th Century

"At the beginning of the 18th century," says Billings, "the only city in which there were any special opportunities for the study of surgery was Paris. There was no place for the barbers or the barber-surgeons in the Universities of Europe, and they had no institutions of their own in which any teaching worthy of the name could be obtained. Many of them had learned something in the camp or on the battlefield, which was the great practice school for surgeons, as it had been for three centuries."¹⁷ The leading French surgeon of the time was Jean Louis Petit (1654-1750), inventor of the screw tourniquet and the first to open the mastoid (1736), and to whom Frederick the Great applied in 1744 for a selection of French surgeons to serve as officers in the Prussian army. Desault, the teacher of Bichat, Dionis, Brasdor, Anel, Littré, La Peyronie, David, Le Cat, Chopart and Daviel are among the prominent French names of the period. In England Cheselden, Pott and John Hunter were the leading figures; in Germany Heister, Bilguer, Gabriel Senff, C. C. von Siebold and A. G. Richter.

In the first half of the 18th century belief in the weapon salve and the sympathetic powder disappeared, and wound-treatment became simpler. Hemorrhage was treated with styptics, of which Heister recommended lycoperdon powder and "the sharpest brandy," and Bilguer the sponge, alcohol and turpentine. Cauterization of blood-vessels in amputation was still practiced by Purmann in 1710, while ligation of arteries (isolated by the forceps), although opposed by J. L. Petit, is described and recommended in Heister's Surgery (1718). In gangrene Bilguer, who was chary of amputation, ligated the principal vessel in the healthy part and then cut down. In ordinary cases he is said to have got unusually good results by free incisions. Wounds were still stuffed with charpie moistened with wine or brandy, and if suppuration threatened, such antiseptics as corrosive sublimate in chalk solution (*aqua phagedaenica*), balsam of Peru, tincture of myrrh, camphor or hot turpentine were sometimes employed (Koehler). While it is to the credit of Bilguer, Schmucker, Theden, and Mursinna that they substituted dry bandages or bandages moistened with plain water for the dubious and complex salves and plasters,

¹⁷ J. S. Billings: History of Surgery, New York, 1895, 69.

yet, as Billings says, the other surgeons of the time "kept on prescribing and using their oils, ointments, plasters, vulnerary drinks, etc.," because these remedies, devised and prepared by themselves, increased their fees. "Charges were made for the remedies and not for the visits." Almost every prominent surgeon had a special arquebusade or vulnerary water the secret of which was jealously guarded. Although Purmann and Voitus, along with the English and French surgeons, declaimed against the unethical foible of secret remedies, they were very popular in Germany. Schmucker had a private eye-water and Theden a secret arquebusade. The probing of wounds, so vigorously opposed by Felix Würtz, continued to be practiced until Stromeyer did away with the probe and Semmelweis, Pirogoff and Lister exposed the evil consequences of dirty fingers. Trephining as a routine procedure in head injuries was upheld by Le Dran, Mareschal, Pott, Bilguer and Mursinna, and opposed by Desault, John Bell and to some extent by Heister. Purmann, who trephined 40 times in 12 years' experience, followed the old Hippocratic rule of operating for pressure symptoms, i. e., vomiting, aural hemorrhage, loss of consciousness and convulsions resulting from depressed or splintered fractures, with subcranial hemorrhage; in headache, epilepsy, vertigo, etc., only when of long duration, Heister limited the operation to open head injuries and extradural hemorrhage. Schmucker and Theden treated most cases by cold compresses. At the siege of Schweidnitz (1762) Schmucker had a special hospital for head injuries, in which he classified and studied his cases. As stated, Bilguer was the great opponent of reckless amputation (1762) or what Frederick the Great styled "lopping off arms and legs by the dozen (1781)." The monograph, although in direct opposition to the teaching of Le Dran, was translated into all languages. Bilguer's six indications were: gangrene, bad mangling of the limb with threatened fatality, marked contusion with multiple fracture, injuries of the great vessels, incurable caries of bone and cancer. Charles White first excised the head of the humerus in 1768, which was repeated by Bent in 1771, while the same operation was performed nine times by Percy, of Napoleon's army, during 1792-5. In 1793 Goercke resected the elbow joint for gunshot wound. Exarticulation or "amputation in the joint" was favored by Schmucker for the shoulder and hip, and rejected in the case of elbow and knee, since the tissues in these parts were not adequate for a suitable flap. Among the bolder operations of the 18th century were the first laparotomy for localized appendicitis by Mestivier (1759), John Warren's amputation of the shoulder-joint (1781), Abernethy's ligations of the external iliac (1796) and common carotid (1796), and the laparotomies of John Bard (1759) and William Baynham (1791-9).

The most original scientific surgeon of the 18th century was John Hunter (1728-93) of Long Calderwood, Scotland, who gained his remarkable knowledge of gunshot wounds while on duty as senior staff surgeon on the Belle Isle expedition (1761) and in Portugal (1763), became deputy surgeon-general of the British Army in 1786 and was appointed surgeon general and inspector of regimental infirmaries in 1791. Hunter was the founder of experimental surgery and surgical pathology and a remarkable pioneer in comparative physiology and experimental morphology.

He first described shock, phlebitis, intussusception, hard chancre and chancroid, introduced the principle of ligating high up in the healthy tissues for aneurism (1786), made many discoveries in human and comparative anatomy and through his great treatises in dentistry (1771); venereal disease (1786), inflammation and gunshot wounds (1794), created a new epoch in surgery. Like other officers of scientific bent he was but an indif-

ferent military administrator and was described by Robert Jackson as "a man of an original mind and considerable discernment, but too little acquainted with military operations in the field to foresee everything that was likely to occur in military service, and provide on all occasions, from his own source of knowledge, the best means of remedy. He considered the cure of diseases, whether by manual operation or the use of internal remedies, as the proper business of a medical man destined for the service of the army."

Military Hygiene in the 18th Century

The personal hygiene of the soldier, his clothing, food, shelter, hospitalization and general sanitary welfare were favorite themes of study with the military authorities of the 18th century and came to be summarized in compact treatises such as those of Pringle (1752), Brocklesby (1764), Monro (1764), Colombier (1772) and others.

The *Réveries* of the Maréchal de Saxe (1738) enlarges particularly upon clothing, foot-gear, rations, bathing, amusements and general creature comforts. Uniforms, supplied as a source of profit by officers in France until 1729 and in England until 1858, were at first theatrical, unsanitary and poorly adapted to heat or cold. Saxe discarded white gaiters, as suitable only for parades, linen stockings, as leading to foot trouble, and garters as constricting the circulation, substituting low-heeled leather shoes, worn upon the bare feet, with puttee-like arrangements, surmounted by leathern breeches buttoned above the knee; the coat was a loose-fitting sack, extending to the thighs or knees, the head-dress being a casque surmounted by a panache of plumes. The Comte de Sainte Germain, Minister of War, proposed a cloth coat, breeches of tricot, a vest of white cloth and a linen girdle." Some 20 odd specimens of uniforms of the different arms, including *just-aucorps* and frock-coats, riding breeches, long riding boots, cravats, cuirasses and three-cornered hats, were exhibited at Dresden in 1911. Greasing or oiling the hands and feet against cold were recommended by Saxe, while Meyserey recommended gloves of fur or thick linen, high leather shoes (*brodequins*) and linen quilts. In the matter of rations Frederick the Great said that the stomach is "the basis and foundation of all military operations". In 1751 the French ration was 28 ounces of bread and half a pound of meat daily, except on Fridays. Saxe insisted that the meat should be served partly as a soup at mid-day and as a roast in the evening. Bread was frequently adulterated at this time, and such bread was regarded as deleterious to wound healing. Unripe or spoiled fruits and unboiled water were common sources of illness. The Roman custom of adding a few drops of vinegar to potable water was followed by Frederick and Napoleon. Wine, beer and cider were permitted in moderation, but French government placards against brandy canteens existed even in 1683. Wines plastered with litharge or other lead salts were true poisons. Rations of tobacco were ordered by Louis XIV (1672-1683). Singing and jollity on the march, theatrical performances in camp, etc., were also regarded by Saxe as excellent for morale and the cheerful disposition necessary for good soldiering. Sites of camps and of latrines were chosen with care, and directors of hospitals were required to wash and whitewash the walls to destroy vermin. French orders of 1701, 1728 and 1752 required daily cleaning of the wards before wound dressing and after the evening meal. The courts, staircases and corridors were swept once daily and the kitchens and bakeries of the hospital were also to be kept scrupulously clean. In spite of all this hospitals continued to be dirty, overcrowded and, in consequence, hotbeds of infection. In 1777-89 the English philanthropist, John Howard (1726-90), published his epoch-making investigations of prisons and lazarettos, which had much to do with the suppression of typhus fever, by demonstrating its transmission through overcrowding

and filth. In 1788 Jacobus René Tenon published a memoir of equal moment on the hospitals of Paris, containing his celebrated description of the Hôtel Dieu. This, the most important landmark in the history of hospital administration, was instrumental in bringing about many important and much needed reforms in Paris, Vienna, Moscow and other cities. At this time even hospital service by physicians was sometimes regarded as a "sentence of death" (Baas). Stephen Hales (1743) and Theden invented methods of artificial ventilation, while Pringle and Brocklesby did much to prove that plenty of fresh air in spacious hospital wards and wide dispersion of the patients in such wards or in separate tents were potent factors in lessening the mortality from communicable diseases. Thus there was but little mortality in the temporary open sheds used for the sick evacuated to the Isle of Wight in 1758, or the small hospital huts introduced by Brocklesby in 1760 and again employed in the camp at Winchester in 1761, although the patients were sometimes exposed to cold and rain. In the Flanders campaigns of 1743-48 it was also observed by Pringle that sickness increased in camps and hospitals located on damp low-lying sites, while detachments quartered in high and dry localities furnished hardly any quota to hospital. In the Low Countries pleurisy and pneumonia, rheumatic affections, intermittent and inflammatory fevers, diarrhoeas and dysenteries were responsible, in the order named, for the highest disease incidence and mortality. In 1762 the following excellent "Regulations for Hospital Management" were proposed by Robert Gordon, a military surgeon attached to Winchester Camp, and approved by Brocklesby:¹⁸

1. A sergeant will be appointed to the hospital to preserve good order and regularity among the sick. He will provide all necessaries ordered by the surgeon, keep an account of the same open to the inspection of every officer, to see that nothing is brought out of the hospital except by his order, especially strong liquor. Every night at tattoo he is to call a roll of the sick, lock the door, and be answerable that none stir out, but go to bed immediately.

2. The pay-sergeant of each company to pay into the hands of the hospital-sergeant every day the subsistence of his men, with all proper necessaries ordered by the surgeon. This account to be settled by the hospital-sergeant with the surgeon every week, and by the surgeon with the paymaster every month.

3. Two orderly men to be appointed by the surgeon, to assist in taking care of the sick at hospital, who are to take their orders from the surgeon or the sergeant of the hospital, which they are punctually to obey.

4. No man on any pretence of illness to be excused parade or any other duty, unless reported to the surgeon, and when reported the sergeant or corporal of his company is immediately to send him to hospital when taken ill; if unable to walk, he is to be carried.

5. After this order every man found sick in his quarters, unless by leave of the surgeon, will be severely punished; any sergeant or corporal found remiss in sending men to hospital immediately, when taken ill, will be assigned or brought to court-martial, and degraded, for neglect.

6. Every man ordered to hospital to take with him his knapsack and necessaries and deliver them to the hospital-sergeant, who is to take them in charge and deliver them to the man when he recovers.

7. If any man in hospital is guilty of irregularity, or refuses to comply with orders of the hospital-physician or sergeant, or makes any disturbance, or shall misbehave himself to the sergeant or his superior officer of the hospital, he will be severely punished.

8. A sentry is to be posted at the hospital door during the morning at the same time as at head-quarters, where instructions as to his duty will be put up at the door in writing,

¹⁸ R. Brocklesby: *Æconomical and Medical Observations*, London, 1864, 81-85. Cited by Gore, *op. cit.*, 94-96.

and read to the relieving sentry by the corporal of the guard at every mounting. Signed by the Colonel to enforce the necessary obedience.

The orders for the sentry were that no patient was to pass beyond his own guard without a ticket from the surgeon; that no strong liquors were to be brought out of hospital. He was to take care of the fire, and see that no mischief was done to the house, that no dirt was thrown near his post or anyone suffered to enter the hospital without cleaning or scraping his shoes, and he was to prevent too many people of the camp or heath from paying frequent or long visits to the hospital.

Brocklesby whose treatise of 1764 is the best book on sanitary administration in the century, also recommended:

1. To avoid all manner of nastiness in every encampment.
2. To pay frequent attention to the shifting and covering in of all the privies in the rear as soon as, or before ever they begin to be offensive to those who are a few yards distant.
3. Always to keep as few possible sick in one room or under the same roof.
4. To air and turn the straw on which the men lie in their tents twice or thrice a week in summer encampments.
5. All buildings selected for military purposes to be as lofty and spacious as possible.
6. The physician's power in a military or camp infirmary to be as peremptory as that of the commanding officer over all his corps out of that place.

The physician was advised to manifest, in all his management of the hospital, an inviolable attachment to method in all things; to fixed hours in dressing the wounded, visiting the sick, having their medicines prepared and proper medicated drinks, without which fixed methods, whenever there were many sick, they would often suffer very much.

Prostitution in the armies of continental Europe¹⁹ ultimately resolved itself into toleration of soldiers' "wives" on the theory that fewer men deserted if domesticated in regiments by women, and that such women, as constituting a species of sexual canteen, were less liable to transmit venereal disease. Prussian orders of June 1, 1713 and February 28, 1714 stipulate that soldiers' wives may occupy quarters but have no claims to light, fuel, food, beds, etc., and the same note is sounded in Austrian Field Regulations of March 12, 1759. An edict of Friedrich Wilhelm I of Prussia limits the number of married soldiers to one-third of the command. A Prussian circular of August 23, 1733 permits 10 per cent of a company to be married. In Frederick's march on Glogau (1740) the first casualty was the accidental drowning of a soldier's wife "of the Bredow regiment" (Carlyle, XII, ch. II). In the Saxon army of 1790 there were 20,000 illegitimate children to 30,000 men. Carnot in 1793 drove 3,000 women away from the barracks at Douai because the diseases transmitted by them "killed ten times as many men as enemy fire." Archenholz, in his *History of the Seven Years War*, tells of the large number of loose women, even in officers' quarters, and of the adoption of the French custom of passing such women, stripped to the waist, through two rows of soldiers who belabored them

¹⁹ W. Haberling: *Ztschr. f. Bekämpfung d. Geschlechtskr.*, Leipz., 1914, XV, 326-332.

with switches. This was forbidden by the French orders of 1750 in which camp followers were to be cured of any diseases in hospital before commitment to the work-house. In spite of the many orders and of such expedients as "tented brothels" (*Hurenzelte*), the problem of limiting prostitution in large commands was as difficult as among the civilian population. Venereal infection was very widespread at this time. When any of the gentry went into seclusion it was assumed that they were undergoing "the tub-fast and the diet." The increase of the neurotic in modern times has been attributed to the fact that the ancestors of the civilized were, like Metchnikoff's ape, "syphilized." The main thesis of Dean Swift's satirical "Argument" against the abolishing of Christianity (1708) was that the clergy were best adapted to propagate healthy specimens of the race, as being less exposed to debauchery and disease.

*The American Revolution*²⁰

The history of our Army Medical Department begins auspiciously in the Colony of Massachusetts Bay where, on May 8, 1775, the Provincial Congress ordered that a committee of physicians, appointed by the Congress, examine as to professional qualifications all persons recommended for appointment as surgeons to the several regiments by their commanding officers. Prior to this date medical aid in such engagements as Concord fight or Lexington had been voluntarily rendered by private physicians, who later sent in bills for services rendered. These physicians had no military status or authority whatever. As described by Thacher in his *Military Journal of 1775* the examinations set in anatomy, physiology, surgery and medicine, were so rigorous that a perspiring candidate, when asked how he would promote sweating in a rheumatic patient, replied: "I would have him examined by a medical committee."

After the battle of Breed's Hill hospitals were established at Cambridge, Watertown, Roxbury and elsewhere, with regulations drafted by the Congress, and appropriate warrants were issued to the hospital surgeons and mates. At this time the inchoate medical establishment of the Army was termed "The Hospital." On July 19, 1775 the Colonial Congress in Philadelphia appointed a committee to consider ways and means of establishing the Hospital, a project strongly recommended by Gen. Washington on July 21. On July 27 Congress reported a bill for its organization, which was adopted, with Dr. Benjamin Church as Director General and Chief Physician, at four dollars *per diem*. Three months later (October 3, 1775) Church was tried by a council of war, for treasonable correspondence with the enemy, and imprisoned. On October 17 Dr. John Morgan was appointed to succeed him. Morgan, who had been instrumental in organizing

²⁰ H. E. Brown: *The Medical Department of the United States Army from 1775 to 1873*. Washington, 1873, 1-86. W. O. Owen: *The Medical Department of the United States Army during the Period of the Revolution*, New York, 1920.

the Medical Department of the University of Pennsylvania (1765), rendered most valuable services up to his unjust dismissal from the Army on January 9, 1777. On April 11 Dr. William Shippen was appointed to succeed him. Meanwhile Morgan had published his spirited *Vindication* (1777) and received a tardy, but handsome exoneration at the hands of Congress on June 12, 1779. Morgan's dismissal was due in part to the increasing sickness among the troops, the difficulty in supplying them with medical supplies, but principally to the fact that Drs. Stringer, Shippen and others had been appointed to regional directorships, with the usual division and decentralization of authority and the jealousies naturally resulting therefrom. At the time of Shippen's appointment the Prussian and English plan of medical administration was in full swing, with Physicians, Surgeons and Deputy Directors General and a fourth staff officer dubbed "Physician and Surgeon General of the Army" in each of the Middle, Eastern and Northern Departments. These four "generals" were of vague status but apparently coeval with the Director General of "The Hospital." All this led to further contretemps such as the resignation of Benjamin Rush in the trying Valley Forge period (1778) and the court martial and acquittal of Shippen (1780). There resulted the Congressional bill of September 30, 1780 with the reelection of Shippen as Director General and the appointment of John Cochran as "Chief Physician and Surgeon." Finally, at the end of the War, Congressional Acts of July 25, 1782 and January 1, 1783 assigned a Director and Deputy Director to the Hospital Department. During the war Washington manifested the keenest interest in the welfare of the medical establishment, particularly in his instructions to Morgan for the removal of the Hospital to New York (April 3, 1776), his letters to John Hancock on the dubious and jealous character of the regimental surgeons and their intrigues against the Hospital (1776-77), and his letter of approval of Shippen's and Cochran's plan for reorganization (February 14, 1777). The animus of Congress had been against centralization, and although the reorganization acts of July 17, 1776, April 7, 1777, February 6, 1778, and July 21, 1780, were progressive in spirit, it took a long time to reach the final stage. Our first hospital regulations were drafted by Morgan after conference with Washington and the regimental surgeons, and published in July, 1776. In March, 1778 Baron von Steuben, a former aide of Frederick the Great, arrived in the country to offer his services to the government. In May, 1778, at the instance of Washington, he was appointed Inspector General of the Army. Steuben's work in improving the organization, drill and discipline of the army, quietly and unobtrusively done, was of the highest value. In 1780 he drafted and published our first Army Regulations, of which the following relates to the medical establishment:

Of the Treatment of the Sick

There is nothing which gains an officer the love of his soldiers more than his care of them under the distress of sickness; it is then he has the power of exerting his humanity and making their situation as agreeable as possible.

Two or three tents should be set apart in every regiment for the reception of such sick as cannot be sent to the general hospital, or whose cases may not require it. And every company shall be constantly furnished with two sacks, to be filled occasionally with straw, and serve as beds for the sick. These sacks to be provided in the same manner as clothing for the troops, and finally issued by the regimental clothier to the captain of each company, who shall be answerable for the same.

When a soldier dies or is dismissed from the hospital, the straw he lay on is to be burnt, and the bedding well washed and aired, before another is permitted to use it.

The sergeants and corporals shall every morning at roll-call give a return of the sick of their respective squads to the first sergeant, who must make out one for the company, and lose no time in delivering it to the surgeon, who will immediately visit them, and

order such as he thinks proper to the regimental hospital; such whose cases require their being sent to the general hospital, he is to report immediately to the surgeon general, or principal surgeon attending the army.

Once every week (and oftener when required) the surgeon will deliver the commanding officer of the regiment a return of the sick of the regiment, with their disorders, distinguishing those in the regimental hospital from those out of it.

When a soldier is sent to the hospital the non-commissioned officer of his squad shall deliver up his arms and accoutrements to the commanding officer of the company, that they may be deposited in the regimental arm-chest.

When a soldier has been sick he must not be put on duty till he has recovered sufficient strength, of which the surgeon should be judge.

The surgeons are to remain with their regiment as well on a march as in camp, that in case of sudden accidents they may be at hand to apply the proper remedies.

In 1778 the earliest American pharmacopœia was prepared for the use of the Continental Army by Dr. William Brown, Physician General of the Middle Department, and published anonymously (second edition, 1781). In 1776 Dr. John Jones published a treatise on wounds and fractures, which was not only the first American book on surgery, but also, through the appendix on camp and military hospitals, our first book on military medicine. In 1777 Benjamin Rush published his pamphlet on the hygiene of troops. Shippen drafted a plan for flying ambulances in 1777, and James Tilton introduced log hut hospitals in 1780. During the war the troops suffered much from sickness and cold, particularly in 1775, when a specimen sick report of September 23 records 2,817 out of 19,365 (145.4 per 1,000), and in the severe winters of 1777-8 (Valley Forge) and 1779-80. The British troops suffered throughout the war from sickness and lack of supplies. Their regimental hospitals are described by Gore as "simple collections of sick men huddled together," without organization, regulations, clothing or rudimentary comforts.

Variolation or preventive inoculation of human virus against smallpox was introduced in England by Lady Mary Wortley Montagu (1718-21) and in America by Zabdiel Boylston (1721). Through the improvements in technic introduced by Kirkpatrick and Gatti (attenuation of the virus and dietetic preparation of the patient) this mode of preventive inoculation attained an almost scientific status, and the custom of "buying the smallpox" (purchase of scabs in open market) became common. The difficulty was that the inoculated person became a true smallpox carrier, while fatal mixed infections were numerous. In the Continental Army inoculation became common among the soldiers during the smallpox epidemic following the retreat from Quebec (1776), although forbidden in General Orders, and use of unattenuated virus produced many fatal infections. The practice continued until swept away by Jennerian vaccination in 1796-8.

After Yorktown (October 19, 1781) Congress rapidly demobilized the Army in 1782-3 and the Hospital Department was practically disbanded. After June 2, 1784 the army consisted of 25 privates at Fort Pitt and 55 at West Point, "with appropriate officers." In 1788 there were 595 militiamen in the United States and 700, with 5 medical officers, in 1789. By the act of March 5, 1792 the army was reorganized as a "Legion" (5,120 men) with Richard Allison as "Surgeon to the Legion" (1792-6). On May 3, 1798, war being imminent with France, Congress authorized an army of 10,000 men with James Craik as Physician General (1798-1800). These forces were disbanded in May-June, 1800. The army was again increased for the war of 1812, and with the appointment of James Tilton as Physician and Surgeon General on June 11, 1818 the history of our permanent Medical Corps begins.

CHAPTER VIII

The Nineteenth Century

Goethe relates that when he heard of the Diamond Necklace affair (1786) he surprised his friends by his strange abstracted demeanor, realizing, as he did, that the end of the old order of things was at hand.¹ Nearly half a century later the same Goethe was bored and indifferent over the July Revolution of 1830, and professed interest only in the contemporary disputes of Cuvier and St. Hilaire, which, in his view, reaffirmed the ancient unity of French science. Enthusiasm for the protagonist of the new order led Beethoven to inscribe the MS. of his Eroica Symphony "Napoleon Bonaparte" (1804). When Napoleon assumed the imperial throne in the same year, the great composer angrily tore off this dedication and dashed it to the ground.² Under such auspices, the nineteenth century was born, and these anecdotes are symbolic of its political and social history. The "wild first year of the change of things" (1793) ushered in a new world; Napoleon's whiff of grape-shot before St. Roch (October 5, 1795) established the modern industrial democracy (*la carrière ouverte aux talents*), and with the battle of Waterloo (1815), England regained the ascendancy which had been hers in the early 17th century. The years between 1793 and Waterloo mark the height of French attainment in war and in the introduction of new ideas. In spite of the constant bloodshed, the spirit of the age of the "rights of man" was, for the Western Europeans, one of intense enthusiasm,³ keyed up to a pitch that thrilled even the passive Wordsworth—

"Bliss was it in that dawn to be alive,
But to be young was very heaven."

In variety and extent of achievement this century surpassed the Ren-

¹ Goethe: *Annalen oder Tag-und Jahreshefte*, 1789. Cotta ed., p. 11. The upshot of this affair was the sensational trial of May 31, 1786, in which the weak-minded Louis XVI threw the question of his wife's honesty into a public court, thus contravening the absolutist doctrine of the divine right of kings.

² The printed title-page reads: *per festeggiare il sovvenire d'un grande uomo*. A striking feature of the enthusiasm of the Napoleonic period is the development of military music of a high order, e. g., Beethoven's *Egmont* and *Coriolanus* overtures, the funeral march in the *Eroica*, the *alla turca* in his "Ruins of Athens," Schubert's "Marche Militaire," the stirring *Rakoczy* of the Hungarian *soldatesca*, etc. The jingling of spurs is heard even in such late salon music as the mazurkas of Chopin, whose *Marche funèbre* is usually played at military funerals.

³ "La Révolution commença par l'enthousiasme des belles âmes de toutes les classes." Stendhal: *Napoléon*, Paris, 1898, 16.

aissance period; in poets consecrated to the cause of liberty, in philosophers, scientists and thinkers of the first order, in publicists and philanthropists who sought to create in the actual world the kingdom not made with hands, in the long line of French painters from Delacroix to Renoir, and of German composers from Beethoven to Wagner and Brahms.

In science the laws of Conservation and Dissipation of Energy, which govern all physical and chemical phenomena, were elucidated by Carnot, Mayer, Joule, Clausius, Kelvin, Helmholtz and Gibbs. Darwin, Huxley and Haeckel created the realistic view of man's origin, evolution and environment. Bichat founded descriptive anatomy in 1800. The cell-theory was developed by Schleiden and Schwann (1838-9) and was the starting point of the sciences of microscopic histology and pathology. Magendie gave a new start to experimental physiology, and Virchow to pathology. Pasteur founded bacteriology, while Koch developed the science of infectious diseases and Ehrlich serology and chemotherapy. From the data of bacteriology, preventive medicine came to be a science. Clinical medicine of the true Hippocratic type was exemplified in such great names as Bretonneau, Louis, Laennec, Trousseau, Bright, Addison, Hodgkin, Graves and Stokes. Laennec invented the stethoscope (1819). Skoda and the French clinicians vastly improved the art of percussion and auscultation, and in establishing clinical thermometry (1868), Wunderlich "found fever a disease and left it a symptom." With the invention of such new instruments as the ophthalmoscope (Helmholtz, 1850) and the laryngoscope (Garcia, 1855), the different specialties began to acquire a scientific status. The history of modern surgery is a long story, turning mainly upon the introduction of anaesthesia (1847) and of antisepsis (Lister, 1867). Operative gynaecology was created by McDowell, Sims and other surgeons of the Southern States. German medicine began to gain its ascendancy with Virchow and Helmholtz (1850). The development of immunology and serology by Pasteur, Roux, Behring, Ehrlich and others, opened out a new view of disease—the biochemical.

The Revolutionary and Napoleonic Wars

In the battles which the "New French" of the Republic fought for its existence during 1792-1800, the general principles of modern warfare, its merits and defects, were developed with startling suddenness, viz., gigantic armies, with a "nation in arms" as an apparently inexhaustible reservoir of personnel; organization of these huge forces into brigades, divisions and army corps; the device *la patrie en danger* as the motor power; "living on the country" with possibilities of loot, as an expedient to secure rapidity of movement (without encumbrance of commissary wagons); and unsparing use of field artillery as the best means of destroying the equilibrium and morale of the enemy's lines.

In the initial "cannonade of Valmy" (1792) and the subsequent victories of Jemappes (1792), Wattignies (1792), Tourcoing (1794) and Fleurus (1794), these "horde tactics," frequently exploited over the roughest ground, proved an unpleasant surprise to the allied armies, bred in the 18th century doctrine of small, well-drilled forces, attacking and retreating by set rules, fighting over open terrain in linear formation, and depending upon supply-wagons. Although desertions were rare in the Republican Armies, voluntary

enlistments began to decrease as soon as the first flush of enthusiasm was over. After Valmy, the paper strength of 800,000 was found to be 402,000 (112,000 regulars), and it was through a compulsory *levée en masse*, under the terrorism of the Committee of Public Safety, that a million men were eventually raised. Generals who failed to make good were promptly guillotined; for officers and men alike it was safer to be in the army than in Paris under the Terror. Apart from the absentee *émigrés*, this condition brought into the field the best of the physically fit as well as hundreds of defectives. France was saved by "a ferocious energy born of liberty and the guillotine . . . not by discipline and organization" (Atkinson). Organization with a fair amount of discipline came, however, through the energies and abilities of Lazare Carnot, the great Republican general and Minister of War, and later through Napoleon, whose genius for assembling forces and ordnance, acting upon swift decisions, concentrating focal attacks upon definite points and inspiring morale in his men by personal contact, created a new era in warfare. A typical army corps of the Napoleonic period—three divisions of infantry and a cavalry brigade, each strongly supported by field artillery—is practically our organization of recent date.⁴

The medical personnel raised for these huge armies⁵ was large, but of unequal merit, poorly trained by reason of the dissolution and non-existence of the French medical faculties during 1792–1803, and badly hampered by the arbitrary and irresponsible rulings of the National Convention, in consequence of which the medical corps of the French army was for a long time kept in leading strings by subordination, not to military authority, but to civilian administration. During 1792–3, as we have seen, the number of medical officers for the Revolutionary Armies was increased from 1,400 (the first voluntary enlistment) to 8,000, reaching 10,000 in 1794, largely through the law of the Convention (August 1, 1793) placing all physicians, surgeons, health officers and pharmacists of 18–40 years of age at the disposal of the Ministry of War. On August 7, 1793 the National Convention started out well with a decree of 7 paragraphs,⁶ establishing the autonomy of the medical corps by assigning its administration to a *Conseil de santé central*, made up of medical officers in the War Ministry (ordinary War Department administration), apportioning the number of medical officers (*officiers de santé*) in armies or military hospitals, authorizing medical instruction in the military hospitals at Lille, Metz, Strassburg and Toulon, and assimilating medical officers to corresponding grades of the line with reference to rations, forage, quarters, etc. In plain practical simplicity and intention this decree compares favorably with the 42 articles of the hospital regulations of 1718, the finest medico-military document of the 18th century.⁷ But hardly had the decree of August 7 gone into effect (September 1), when the fall of Robespierre established a new alignment resulting in the pernicious law of 3 ventôse II (February 24, 1794),⁸ through which the central *Conseil de santé* was displaced by a *Commission de santé*, under direction of a provisional "Executive Council," while military hospital administration was allocated to a "Supervising Administrative Committee," consisting of two municipal functionaries, two members of the Committee of Safety of the locality and the temporary commandant. To these latter, the chief medical officers, the war commissary and the directors were to report when so ordered. Still more ominous was the Ministerial Regulation of 30 floréal IV (May 20, 1796),⁹ by which the authority for establishment of army

⁴Atkinson: *Encyclop. Britannica*, xi ed., Cambridge, 1910, ii, 601; 619.

⁵G. Morache: *Dict. encyclop. d. sc. méd.* (Dechambre), Paris, 1877, 2 s., viii, 92–104.

⁶For text, see Morache: *op. cit.*, 94–96.

⁷For text, see, Morache: *op. cit.*, 81–83.

⁸Morache: *op. cit.*, 96–7.

⁹Morache, 98–101.

hospitals, mobilization and disposition of ambulances at the front and transportation of the wounded was taken from the chief surgeons and given to a *Commissionaire ordonnateur*, to whom all medical officers were subordinated, while chiefs of medical service in hospital were forbidden to have anything to do with its administration. The effect of this arrangement was to demoralize the medical service and to drive all worthwhile medical officers away from the military hospitals into the field. "From the line of the army in the field," says Morache, "the medical officers met with just consideration and equitable appreciation of their services." When they sought to elude hospital service in wartime, they got vigorous support from their colonels, who, while complying with the arrangement in peace, defeated it in war by passive resistance to orders detaching surgeons from their commands for hospital service in the interior.¹⁰ The bright side of the French medical officer's experience in the Napoleonic period is therefore to be found in the field, and what he was able to accomplish was due to his military rather than his official superiors.

In the history of military medicine, Napoleon is to be regarded as a commander who accorded to favorites like Larrey or Percy every opportunity to forward medical administration, according to their lights; but who was too much preoccupied with his innumerable ambitions and plans to give it more than passing attention. Of a leading Corsican family, "born when his country was dying," bred in the backwoods cult of the *vendetta*, endowed with "more than Italian passion," a patriot in Ajaccio, an *arriviste* in Paris,¹¹ his ultimate mastery of his emotions gave him that cold marble repose in the saddle, that contempt for human life, which he was eventually to merge into a dry fatalistic disregard for the husbanding and salvage of personnel, the prime requisite in warfare on a grand scale. The reckless wastage of forces by the Revolutionary Armies had, in fact, inured him to the belief that he himself "cared little for the lives of millions of men." His conversations with Corvisart reveal the same contempt for medicine that we find in Frederick. But he was by training a soldier himself, had a lively fellow feeling with comrades in arms and was by no means lacking in a certain *grandeur d'âme* toward his medical officers and wounded men.

¹⁰ Morache: *op. cit.*, 102.

¹¹ It is a mistake to regard Napoleon as a parvenu in origin. The opening sentence of his letter to Paoli ("I was born when my country was dying") is the cry of the disinherited of 1789. The family was an ancient one, if we may trust Mauro, a 16th century chronicler: "*Bonapartia gens, et nobilis et antiqua, ante annum 1200 inter nobiles semper fuisse reperitur.*" He was rather the opportunist, who hypnotized individuals and polarized nations, but made himself, in the end, as Emerson says, the attorney of the great pushing middle class, of whom every *arriviste* sought to be "a little Napoleon." In his final phase, his relation to a possible victory became "that of the politician to the baby he kisses." Such bromides as "that passage in Josephus about Jesus" (loudly repeated in the great Paris library) or "*Il fait chaud*" (repeated twenty times at a reception) were obviously gallery-play ("defensive reactions") if contrasted with the point and pungency of his aphorisms about war and government. His early training was arid and narrow, and in society and in the presence of women, he was dry and uninteresting. Stendhal's chapter "*La cour*," tells, with characteristic malice, of his total failure to create, as "emperor," what the Parisians expected of him—an elegant social order. After Tilsit, even his bonhomie with comrades degenerated into the "*sécheresse*" of which his officers bore the brunt at Waterloo. (Varnhagen, Stendhal, Capt. Gronow).

Of hospitalization of the sick we hear but little, for military hygiene in the modern sense was non-existent, and the sanitary status of hospitals was almost the lowest in recorded history. Napoleon's campaigns, the favorite argument of the pacifists, present an appalling mortality from disease. Time and again he visited the wounded in hospital, listened to the reports of Larrey, Percy and Heurteloup after each battle, always inquired if the ambulances were provided with necessities, but was given to making florid promises which he sometimes forgot or was unable to keep. Seeing the pitiful condition of the wounded at Erfurt, he said, "I donate 6,000 francs daily to the hospitals out of my private funds," and galloped away, apparently oblivious to the fact that this allotment could not be disbursed (as the sequel proved) without a written order. At Berlin in 1806 he convened all his medical chiefs to the palace and promised to make them an independent *Corps impérial*, but this, too, came to nothing. The recommendation to the Ministry for a better organization, signed by Coste, Heurteloup, Larrey, Desgenettes and Percy in 1810, was laid on the table.¹² Yet in Egypt Bonaparte gave up all his horses to the ambulance service, dismounting himself and marching on foot with the infantry.¹³ At Eylau Baron Percy said that he could have obtained from him his very clothing for bandaging if necessary. The terrible break-down in hospitalization during the epidemics of 1813 has been attributed to the extreme parsimony of the General Intendant, M. Daru, toward the Medical Corps. The vice of the Napoleonic system (as with the Prussian General Staff in the recent war) lay in the mistaken belief that a nation in arms is an inexhaustible reservoir of personnel.

After the splendid victories of 1794-6, the direct result of Carnot's fine administration, scarcity of personnel began already to be felt. Conscription, following the Jourdan law of 1798, came to be regarded as a sentence to life service, and by 1806, one-fourth of Napoleon's conscripts failed to come up for duty. The fine flower of his veterans, the backbone of the Grand Army, were gradually eliminated through battle-losses. In 1810 the number of absentees was 80 per cent. Meanwhile, in consequence of the law of 1798, 40,000 picked veterans were constantly employed in hunting down slackers, so that, in the end, about 100,000 men were engaged in a kind of civil war within French territory. In 1810 one-third of the Grand Army (now a dynastic concern) was German in composition. In 1812 280,000 of the 467,000 men who started on the Russian campaign were unwilling foreigners,¹⁴ who rapidly deserted on opportunity,¹⁵ leaving the rest an easy prey

¹² Morache: *op. cit.*, 103.

¹³ This was the subject of a painting by Horace Vernet, reproduced in Cabanès: *Chirurgiens et blessés*, Paris, 1918, 401.

¹⁴ Atkinson: *op. cit.*, 602, 619.

¹⁵ "Un colonel de mes amis me racontait, en allant en Russie, que depuis trois ans *il avait vu passer trente-six mille hommes dans son régiment*. Chaque année il y avait moins d'instruction, moins de discipline, moins de patience, moins d'exactitude dans l'obéissance." Stendhal: *Napoléon*, 49.

to the allied forces at Leipzig (1813), now animated by the same fiery patriotism which had inspired the French in the Wars of the Revolution.

Larrey

The most eminent medical officer of the Napoleonic period was unquestionably Dominique-Jean Larrey (1766–1842), Chief Surgeon of the Grande Armée and the inventor of “flying ambulances.” Originally a choir-boy in the Pyrenees, he studied medicine, and first served in the Navy, but later joined the Army of the Rhine in 1792. He met Napoleon at Toulon (1794), served in all his campaigns, and the two became fast friends. Napoleon did not like desk-officers and would promote none who had not served with troops under fire¹⁶ or who had not been wounded in action. Larrey was thrice wounded and so won the esteem as well as the affection of his chief, of whom Stendhal records that to see him ride along the line after a battle, encourage deserving and wounded officers and promote them, was one of the big moments of existence.¹⁷

Larrey took part in no less than 60 battles and 400 engagements, and indeed devoted his whole career to military surgery and to the welfare of the wounded soldier. His life was saved by Blücher at Waterloo. He was a bold and enterprising operator with an extraordinary number of successful cases to his credit, became professor at the School of Military Medicine at Val de Grâce (founded 1796), and wherever he happened to be he set up a school of military surgery. In Egypt he was the first to point out the contagious nature of granular conjunctivitis (1802), improved wound excision (*débridement préventif*), invented curved needles, used Labarraque’s antiseptic solution to wash putrid wounds, and made other important innovations in all branches of military surgery. Early in the Revolutionary wars he noticed that, in consequence of the old 18th century rule of relieving the wounded only after a battle, transportation to base hospitals occupied 24–36 hours, due to stalling of vehicles on the roads. Larrey reasoned that it was better administration to take the hospital to the wounded, whence arose the celebrated *ambulances volantes* (1792).¹⁸ These were of two kinds, viz., light closed two-wheelers carrying two wounded men each, drawn by two horses, for rapid movement over even ground, and heavier four-wheelers carrying four men, drawn by four horses, for rough, precipitous

¹⁶ “Non, Messieurs! jamais je ne consentirai à avancer un officier qui n’est pas allé au feu pendant dix ans.” Stendhal: Napoléon, 45.

¹⁷ “À l’armée, après une victoire on après un simple avantage remporté par une division, l’Empereur passait toujours une revue; Après avoir passé dans les rangs, accompagné du colonel et parlé à tous ses soldats qui s’étaient distingués, il faisait battre au ban et les officiers se réunissaient autour de lui. Si un chef de bataillon avait été tué, il demandait tout haut quel était le plus brave capitaine. Là, dans la chaleur de l’enthousiasme pour la victoire, et pour le grand homme, les avis étaient sincères, les réponses étaient loyales. Si le brave capitaine n’avait pas de moyens pour être chef de bataillon, il lui donnait son avancement dans la Légion d’Honneur, et revenant à sa question demandait: ‘Après un tel, quel est le plus brave?’ Le prince de Neufchâtel tenait note des promotions avec son crayon. Dans ces moments, j’ai vu des soldats pleurer de tendresse pour le grand homme.” Stendhal: Napoléon, Paris, 1898, 46.

¹⁸ Ambulance service during battle became possible through the predominance of the artillery arm over the old-fashioned volley-firing of musketry in platoon formation. The early Revolutionary Armies, after disastrous experience with linear formation in close order, began presently to choose rough ground, to fight in open order over the widest possible front, and at the same time to leave the early issue to field artillery and skirmishers, holding the majority behind the front lines for the final charge.

ground. These wagons were fitted with removable litters (provided with mattresses and rolling on castors). Both varieties had holes for ventilation and carried refreshments and bandaging material. Hundreds of these wagons were eventually in action,¹⁹ beginning operations directly battle was joined, but it is said they were seldom employed outside the Guard. In the army of the North Percy originated another kind of wagon carrying 8 surgeons, 8 hospital attendants and bandaging material, but these were not designed for evacuation. To Percy is due the organization of squads of litter-bearers (*brancardiers*), who were first employed in the Spanish campaigns (1808), and were then added by Larrey to the *ambulances volantes*. In Egypt Larrey employed camel transportation with swinging side-panniers (*cacolets*), and sent his wounded from Alexandria to Marseilles in hospital ships. But in spite of the big humanitarian spirit of Larrey the sick and wounded were frequently abandoned through lack of transport on Napoleon's forced marches and retreats, or else as Duncan says, "were stuffed in buildings of every sort and left to die."²⁰ Of the Peninsular campaigns General Foy recounts that "we lost four times as many men through the disorder inseparable from our system of warfare as from the fire and steel of the enemy."²¹ An anonymous publication of 1814 abounds in gruesome details of the misery of the sick and wounded in the hospitals of 1813, which the writer styles "the sepulchres of the Grand Army."²² Of the small amount of good which came out of the innumerable edicts and regulations of the National Convention Morache observes, with a touch of sadness: "*Malheureusement il y a toujours en France un grand écart entre ce qui est prescrit et ce qui s'exécute réellement.*"²³ But we shall presently see that these discrepancies between plan and performance are by no means confined to France.

*The Peninsular Campaign*²⁴

The part played by England in the Revolutionary Wars was mainly at sea. Nelson's great victory off Cape Trafalgar (October 21, 1803) at length convinced Napoleon that he had no chance on the water.

In the Egyptian campaign sickness began to increase after the battle of the Nile, the troops suffering mainly from granular conjunctivitis, dysentery and liver complaints. The total death rate was 109 per thousand for European and 60 per thousand for native troops; the losses from invaliding 41 and 6 per thousand respectively. In April, 1809 39,214 men were conveyed to the island of Walcheren in 245 transports, with one hospital ship, an expedition directed against Napoleon's naval base at Antwerp. By August 15 3,000 men were down with fever. By September 14 8,000 were reported sick and on October 22 only 4,000 were fit for duty. The total mortality was 217 from battle casualties and 4,175 from disease, the expedition proving the failure that Napoleon had predicted ("fever will finish them"). Some sixty years before, Pringle had gone over this ground and described its diseases, with an inkling of what might happen. In April 1809 Sir

¹⁹ The *Division d'ambulances* proposed by Larrey for the Rhine campaign consisted of 1 surgeon first class, 2 surgeons second class, 12 surgeons third class, 12 hospital attendants (*infirmiers*), all mounted, 44 hospital attendants on foot, and the line officers and non-commissioned officers attached to the trains. The train consisted of 12 light ambulances (8 two-wheelers, 4 four-wheelers) and 4 heavy ditto, outfitted with matériel and refreshments, and accommodating 2-4 wounded. The heavy ambulances were ordinary transport wagons (*fourgons*). Officers and privates alike carried pouches of bandaging matériel, and were distinguished from the rest of the command by a special scarf. Knorr: *op. cit.*, 207-208.

²⁰ L. C. Duncan: Disease and Battle Casualties. Seaman Prize Essay, p. 22.

²¹ Foy: *Histoire de la guerre de la Péninsule*, Paris, 1827, i, 145. Cited by Morache, 103.

²² *Les sépulcres de la Grande Armée, ou tableau des hôpitaux pendant la dernière campagne de Bonaparte*. Paris, Eymery, 1813, Cited by Gurlt.

²³ Morache: *op. cit.*, 99.

²⁴ A. A. Gore: *The Story of Our Services under the Crown*. London, 1879, 153-160.

Arthur Wellesley arrived in Portugal, with Dr. Frank as chief medical officer of his forces. Before the end of the year there were some 7,000 sick, of whom nearly 4,000 died. During the Peninsular War the average sick-rate was 210 per 1,000, the principal diseases being fevers, dysentery, rheumatism and respiratory affections, with hospital gangrene and tetanus among the wounded. The soil was damp, and prior to the siege of San Sebastian (1813) there were no tents, the men living in huts of wattled boughs. There was much malingering; as many as 600 bayonets were sent back to duty in a month by clearing the hospitals of shirkers. Large general hospitals were established at Lisbon and Coimbra for the reception of sick who could not be transported. The annual loss during 1811 was 20,553, including 12,356 deaths. The death-rate during 1808-14 was 118 per 1,000, the total losses 24,930 out of 61,511 from disease and 8,889 from battle casualties. Lord Wellington's administrative arrangements were good and he was well inclined to the medical service, in which he was ably supported by Sir James McGrigor (1771-1858),²⁵ who joined his forces in 1812 and at whose instance medical officers were first gazetted in despatches for bravery in action after the assault on Badajoz (1812). During September 1812-June 1813 some 93,348 sick and wounded were admitted to hospital. McGrigor, who had seen the finale of the fatal Walcheren expedition, reduced this sick list to 5,000, was generously rewarded and praised at the end of the war, and became Director General of the Medical Department (1816-51). In 1816 he founded the famous pathological museum and library at Fort Pitt (later Netley) and inaugurated the system of medical reports and statistical army returns of the present Blue Book (1816). Much was done to reform sanitary administration by Robert Jackson (1750-1827)²⁶ of Scotland, whose books and writings of 1798-1824 lay down basic principles which might have been better enforced in his lifetime but for his pugnacious disposition. He was an early champion for suitable military rank, emolument and honors for British medical officers, but, to the detriment of his cause, was a man of strife and contention. He reasoned that "handling a knife is the least part of a regimental surgeon's duty" and that "the medical officer claims to himself the rank of gentleman."²⁷ He estimated that 2 medical officers per 1,000 were needed in peace and 3 per 1,000 in war, and urged the employment of sanitary personnel ("health officers") in the army. The Royal Warrant of January 1, 1806, stopping 10s. per diem for the hospital fund, was due to Jackson's demonstration that the sum which fed a soldier in barracks sufficed (at that time) to provide him with food and comforts in hospital.

The War of Liberation

Like most military supermen who become infected with the fatal virus of world conquest, Napoleon eventually overreached himself and

²⁵ For his career, see Gore; *op. cit.*, 149-158 *passim*.

²⁶ For Jackson's career, see Gore: *op. cit.*, 119-124, and Crummer: *Mil. Surgeon*, Wash., 1922 L, 107-122.

²⁷ "Rank of gentleman": This is a phase of the naïve romanticism of the Georgian-Victorian era which so endears the 19th century to us. The "rank" implied is that of independent landed gentry. It will be remembered that the Prussian field-barber had to shave the officers and was cudgelled by his superiors if refractory. An eminent English surgeon said of that rough diamond John Hunter: "He alone made us gentlemen." Lady Chettam in "Middlemarch" refers to her family physician as having the social qualifications of her butcher. In the more realistic 20th century, it was perceived that the medical officer, if shorn of proper military authority (as was the younger Larrey at Solferino); can do nothing for relief of the sick and wounded in campaign; otherwise, he made his own social position, as did Paré or Vesalius in the past. Under democracy the constant "I'm a gentleman" in the mouths of bounders and ruffians became so farcical that the cheerful cynicism of a wealthy "baronet" in an English melodrama—"My wife is not a lady and I am only a shopkeeper"—was greeted by the audience with spontaneous and enthusiastic applause.

did nothing well after the battle of Wagram (1809). He had been worsted by England on the seas, his wasteful campaign across the Pyrenees made Spain "the Frenchman's graveyard,"²⁸ his second marriage was a political blunder of the first order, and the disastrous Russian invasion of 1812 sealed his fate. He had said with prophetic insight, "Conquest has made me what I am and conquest must maintain me." It had long been perceived by the nations gathered to finish him that his mighty empire was held together solely by his unique personality and military genius. The first steps toward Waterloo were taken by Wellington in the Peninsula and by the Prussians in the "War of Liberation."

After the annihilation of the Prussians at Jena (1806) the restrictions of the treaty cutting down the army to 43,000 men were evaded by the so called *Krümpfer* system, through which the men in the ranks were put on short service and secretly replaced as rapidly as possible, thus building up an endless chain of reserves which, in Scharnhorst's phrase, amounted virtually to "universal service." It is upon this newer economics that the modern theory of universal training of reserves is based.

Goercke

During the Revolutionary Wars the Prussian medical service had become ossified and out of date. The new spirit infused into it was due to Johannes Goercke²⁹ (1750-1822), surgeon general during 1797-1822.

At this time, the status of medicine in Germany was backward, and apart from few names like Heim, Hufeland or Reil, there is little to its credit. Goercke devoted two years to the close study of medicine in all the leading centers of Europe, and after his discouraging experiences in the Revolutionary Wars (1792-5), the *Pepinière* for better instruction of medical officers was founded at Berlin, at his instance, on August 2, 1795. In 1801 he induced the king to establish a definite system of pensions for invalided medical officers and in the same year required personal reports on the efficiency of company surgeons to be sent in by battalion and regimental surgeons. Through his efforts the military hospitals prepared for the reception of the wounded from Eylau (1807) were found to be models of cleanliness and good ventilation. He served through all the campaigns of the period and was so much admired by Baron Percy that the latter induced Napoleon to make a handsome contribution to the *Pepinière* in 1805.³⁰ This institution, which became the Friedrich Wilhelms Institut in 1818, graduated 1,359 medical officers during 1795-1821. In the Rhine campaign (1793) Goercke obtained funds for a movable field hospital for 1,000 patients, which rendered effective service, but there were none during 1806-9. The direction of the field hospital service was eventually assigned to Goercke (August 8, 1809), who drafted the new hospital regulations of October 2, 1809. In August, 1813

²⁸ The ghastly features of the Peninsular Wars, including the various devices of "frightfulness" (rape and mutilation of the defenceless) have been preserved by the Spanish artist Goya in his album of etchings "*Los Desastres de la Guerra*."

²⁹ For biography of Goercke, see, Bock & Hasenknopf: *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Berl., 1901, Heft 18, 219-260.

³⁰ For Goercke's own account of this, see Bock & Hasenknopf: *op. cit.*, 247.

the army had 3 general hospitals of 1,200 beds each, 1 reserve hospital of 3,000 beds and 9 field hospitals of 200 beds each—a total of 8,400 beds. There were 38 (eventually 124) “provincial (reserve) hospitals” in the towns, and of those the elder Graefe was director during 1813–15. Wooden barracks, introduced into Austria in 1788, appeared in Prussia in 1805–6, and a number of barrack hospitals were erected in 1813–15. Voluntary nursing was in vogue from 1800 on and received a powerful impetus under the patronage of Princess Marianne of Prussia (March 23, 1813). Transportation of the wounded was effected by water during the Rhine campaign of 1792–5. Transport wagons were introduced by Goercke in 1795, but only 3 were available in 1813. Litters and litter-bearers were not known in Prussia before Goercke’s publication of 1814.³¹ In 1822, disheartened by the constant attempts to undo his *Pepinière*, Goercke sent in his resignation to the king after 55 years service, and died six weeks later (June 30, 1822). His successors were J. W. von Wiebel (1822), C. F. Lohmeyer (1847), H. G. Grimm (1851), G. A. von Lauer (1879), Alwin von Coler (1889) and Otto von Schjerning (1905–18).³²

Battle Losses in the Napoleonic Wars ³³

Of the 4½ million soldiers engaged in the Revolutionary and Napoleonic Armies during 1792–1815 about 2½ million died in hospital and 150,000 were killed in action. Frölich computes the total losses of the French and the Allies in the Napoleonic campaigns (1801–15) to be, in round numbers, 5,925,084. In the Egyptian campaign (1798–1800) Bonaparte lost 4,758 out of 30,000 in action and 4,157 from disease, of whom 1,689, including 40 medical officers, died from bubonic plague. On the Russian campaign (1812) his total forces, increased to 533,000 by reinforcements, had shrunk to 95,000 when he reached Moscow, although there had been only two battles, while the Russians lost about 170,000 out of 210,000. The campaign of 1813–14 cost both sides 450,000 and that of Waterloo 60,000. Between July, 1813 and March, 1814 there were 133,965 sick and wounded in the Prussian military hospitals, and of these 15,748 died, 84,805 were discharged cured, 3,177 were invalided, and 394 unaccounted, leaving on hand in March, 1814 29,841 (6,422 sick, 23,419 wounded). During June–August, 1815 42,092 sick and wounded were treated in 60 military hospitals between Memel and Evreux, of whom 948 died, 29,165 recovered, 626 were invalided, and 60 unaccounted, leaving 11,293 on hand on September 1.

The losses in the principal battles from Austerlitz to Waterloo were:

Austerlitz (December 2, 1805): French, 12,000 killed and wounded out of 94,000; Austrians and Russians, 26,000–30,000 out of 84,000.

Jena–Auerstadt (October 14, 1806): French, 6,000 out of 96,000; Prussians, 12,000 out of 54,000.

Eylau (February 8, 1807): French, 15,000 out of 79,000; Allies, 18,000 out of 74,000.

Friedland (June 14, 1807): French, 12,100 out of 86,000; Russians, 10,000 out of 46,000.

Aspern (May 21–23, 1809): French, 8,000 killed, 24,000 wounded out of 70,000; Austrians, 4,287 killed, 16,213 wounded out of 80,000.

Wagram (July 6, 1809): French, 23,000 killed and wounded, 7,000 missing out of 181,700; Austrians, 19,110 killed and wounded, 6,740 missing out of 128,600.

³¹ Goercke: *Kurze Beschreibung der bei der k. preussischen Armee stattfindenden Krankentransportmittel*, Berlin, 1814. For full account of the hospitals, transport, voluntary nursing, etc., see, Bock & Hasenknopf: *op. cit.*, 156–200.

³² P. Myrdacz: *Das deutsche Militär-Sanitätswesen*, Wien, 1896, 28.

³³ C. Richter: *Allgemeine Chirurgie der Schussverletzungen im Kriege*, Breslau, 1877, 898–940. Frölich: *Ztschr. f. Krankenpfl.*, Berl., 1896, xviii, 89–90. Bock & Hasenknopf: *op. cit.* (Veröffentl. (etc.), 1918, xviii, 196).

Smolensk (August 17, 1812): French, 20,000 out of 180,000; Russians, (?) out of 130,000.

Borodino (September 9, 1812): French, 32,000 out of 130,000; Russians, 42,000 out of 121,000.

Gross-Gorschen (May 2, 1813): French, 6,000 killed, 11,000 wounded out of 90,000; Allies, 10,000 killed and wounded out of 54,000.

Bautzen (May 20-21, 1813): French, 5,000 killed, 14,000 wounded out of 150,000; Prussians and Russians, 7,500 killed, 16,000 wounded out of 110,000.

Leipzig (October 16-19, 1813): French, 30,000 out of 145,000; Allies, 60,231 out of 300,000.

Quatre Bras (June 16, 1815): French, 4,300 out of 22,000; Allies, 5,600 out of 33,000.

Ligny (June 18, 1815): French, 8,500 out of 71,000; Prussians, 12,000 out of 84,000.

Waterloo³⁴ (June 18, 1815): French, 30,000 killed and wounded, 6,000 prisoners out of 72,000; Allies, 21,997 (1,120 officers) out of 120,000. (British 15,000; Prussians 6,000—7,000).

The Mexican War ³⁵

The Mexican War (1846-48) is highly instructive to Americans as a campaign of small dimensions, entered upon caravan-wise with boyish, meridional enthusiasm, waged in an unknown country without forethought or adequate preparation, by an army equipped on a peace footing, and carried to a successful issue in spite of untold suffering from lack of clothing, supplies, rolling stock and adequate medical administration. At this time the Regular Army numbered 7,500 and the Medical Department consisted of a Surgeon General with the rank of colonel, and 71 medical officers, increased by Congressional acts of 1846-7 to 115, with 135 surgeons for volunteer forces (total 250). About 100,000 men were sent to Mexico during 1846-8, so that only 6 companies of regular troops were left in the whole United States (Duncan). The commanding general (Winfield Scott) was a veteran of tried ability, who stands high in the annals of his profession as an officer who consulted freely with his medical staff. He was accompanied by the Surgeon General (Thomas Lawson) in person. The motor power of this campaign was romantic enthusiasm, rather than the "hostile feeling" or the "hostile view" of the military authorities. Under the "hostile view" an armed force (e. g., that of Dewey at Manila) is an impersonal agent of government, executing the will of government in wars imposed upon a nation by an impersonal "enemy," and it is the duty of the people to maintain such forces in adequate preparedness to insure against the humiliating consequences of defeat and major losses from battle casualties and disease. The lack of medical preparedness in the Mexican War was no worse than that in the Crimean or Solferino episodes, and was due to the lack of real knowledge of military sanitation at the time. There were no ambulances in the army before 1859. Only 180 mule-drawn wagons were available on April 5, 1847. There were no shelter or hospital tents, hospital equipment, cooking utensils or other conveniences, and marching for months in one uniform the soldiers were soon barefooted and in rags. Ignorance of the character of water-supplies brought hundreds down with diarrhoea and dysentery; hospitals were hastily improvised in any convenient buildings, and the misery of the sick was increased by the squalor of Latin surroundings. Conditions improved after the entry into the Mexican capital, when General Scott levied \$20,000 "for the sick in hospital." Duncan gives the total losses as 1,549 killed and died of wounds, 10,951 died of disease, 13,825 discharged for disability. The heaviest casualties were at Cherubusco (1,074), Molino del Rey (779) and Chapultepec (861). The disease rate was 110 per 1,000 as compared with 65 in the Civil War and 16 in the World

³⁴ Called by the Prussians "Belle Alliance."

³⁵ J. B. Porter: *Am. J. M. Sc., Phila.*, 1852, n. s., xxiii, 13; xxiv, 13; 1853, xxv, 25; xxvi, 296; 1858, xxxv, 347. L. C. Duncan: *Mil. Surgeon, Wash.*, 1920, xlvii, 436; 596; 1921, xlvii, 76.

War. The sick-rate from dysentery was high and the disease was widely spread through the home country by the returning troops. Through the Mexican war the United States acquired Texas, New Mexico and California, for which \$15,000,000 were paid by the government; while the army gained retirement for officers, military rank for medical officers and the Soldiers' Home at Washington.

*The Crimean War*³⁶

Of all recorded wars the Crimean (1854-55) has perhaps the greatest teaching value for military medicine. For the Western allies it was fought in a circumscribed area far distant from the centers of authority and supplies. The English and French commanders soon found themselves hampered by conflict with their home governments as to the conduct of the war, to the utter neglect of proper sanitary and supply service, a condition which well-nigh wrecked the whole enterprise through losses from communicable diseases. The establishment of telegraphic communication between France, England and the Crimea imposed a dreadful incubus upon those in actual contact with the enemy. London and Paris burned the wires with strange administrative orders which blighted the energies of able commanders and all but extinguished the medical service. Canrobert resigned to serve faithfully in a subordinate capacity. His successor, Pelissier, was reduced to impotent fury and Lord Raglan died of worry. The medical officers of the French army were completely subordinated to the *intendance* or civil administration and had no authority beyond that of ordinary civilian practitioners at the bedside. In the British service the status of battalion and regimental surgeons was virtually the same, although the hospital and ambulance service was officered by the line, with no distant bureaucratic control.

The war lasted from September 14, 1854 to July 12, 1856, and was mainly concentrated on the siege of Sebastopol, the sally-port of the Russian fleet. The assault on the Malakoff and the capture of Sebastopol terminated a drawn contest which resulted in nothing, and which cost Great Britain \$335,340,000, France \$451,980,000 and Russia \$690,120,000. The total French forces in the Crimea numbered 309,268 men, of whom 500 were medical officers; the English, 97,864, with 448 medical officers; the Russians, 324,478 with 1,608 army surgeons and 3,759 Feldshers; the Sardinian, 21,000, with 88 surgeons; the Turkish 35,000 with no medical personnel whatever. Berndt estimates the total losses from all causes as: Allies, 252,600; Russians, 256,000, and Mulhall gives even larger figures. Myrdacz estimates:

French: 8,250 killed; 39,868 wounded; 4,354 died of wounds; 196,430 sick; 59,815 died of sickness.

³⁶Great Britain: Medical and surgical history (etc.), 2 vols. London, 1858. Sir T. Longmore: The Sanitary Contrasts of the British and French Armies during the Crimean War. London, 1883. P. Myrdacz: Sanitäts-Geschichte des Krimkrieges. Wien, 1895. F. H. Garrison: Mil. Surgeon, Wash., 1917, xli, 457-473. For the life of Pirogoff, see his "Lebensfragen" in Bibliothek russischer Denkwürdigkeiten, Stuttgart, J. G. Cotta, 1894, an astonishing mixture of religious mysticism and sagacity.

English: 2,755 killed; 18,283 wounded; 1,847 died of wounds; 144,390 sick; 17,225 died of sickness.

Russians: 21,000 killed; 92,381 wounded; 14,671 died of wounds; 332,097 sick; 37,454 died of sickness.

In other words the Russians had twice as many killed and wounded as the allies, while the ratio of battle casualties to deaths from disease was 1.4 among the allies, and 1.1 among the Russians. Among the French the mortality from disease was 253.5 per 1,000; that of the English 119.3, that of the Russians 161.3. The Crimean War shows the highest battle losses per thousand (among the Russians) and from disease (among the French) of all the wars in history. These latter were largely due to cholera, typhus fever dysentery and scurvy. Longmore's computations show that exclusive of cholera, the British losses from disease during 1854 were 2,373, the French 1,857, while in 1856 the English lost only 218, the French 17,129, and for the following reasons: The British entered upon the war in a state of unpreparedness, with only 40 ambulance wagons, a pack-mule and 10 litters for each regiment, no winter clothing, no shelter tents and a worthless corps of male nurses, commandeered from the line; while the French had shelter tents, division ambulance companies (field hospitals of 18 tents), abundant supplies and matériel, and even fur overcoats. As time wore on the terrible losses among the British from disease created a great sensation in the press, with the result that Parliament and the public took hold of the situation and sent out clothing, supplies and transport in profusion. At the instance of Sidney Herbert Florence Nightingale went out with a corps of trained nurses and what she accomplished created modern nursing. The suffering troops were eventually housed in wooden huts with adequate creature comforts. Even the food-supply and cookery were in the hands of the famous *chef*, Alexis Soyer.³⁷ Meanwhile the French, still under canvas in the severe winters of 1855-6, were worn out with the prolonged exertion of warfare; their mortality and mortality statistics went up as the English went down. Thus the conclusion of the war was an object lesson in the evils resulting from lack of sanitary preparedness and in those resulting from gradual slackening of the eternal vigilance which is necessary to good sanitation. The Russians eventually secured a large corps of trained nurses under the direction of Nikolai Ivanovich Pirogoff (1810-81), a military surgeon of the first rank. In England the scandals incident to the War resulted in a prolonged investigation, the publication of the first medical and surgical history of a war by government (8 vols., London, 1855-8), and enlarged military authority for British medical officers.

The lesson of the Crimean War is that a central civil administration will do little for the successful conduct of a campaign, if it neglects its primal duty of sending all necessary supplies, reinforcements and medical aid to the forces at the front, yet hampers their commanders and medical officers with orders and suggestions based upon academic assumptions and insufficient knowledge of actual conditions at the theatre of war.

*The Italian Campaign of 1859*³⁸

This war, waged for the liberation of Italy from the Austrian yoke, was fought by 70,000 Sardinians under Victor Emanuel II, 128,000 French allies and 230,000 Austrians. In the actions at Montebello (May 20), Palestro (May 31), Melegnano (June 8), and the battles of Magenta (June 4) and Solferino (June 24), the Austrians were defeated. The peace of Villafranca (July 11) ceded Lombardy to Piedmont while Venice was retained by Austria. The Austrian Army had ambulances, field hospitals and sanitary com-

³⁷ For an account of Soyer's remarkable work, see the interesting article by Capt. J. S. Taylor, U. S. N., in U. S. Naval Med. Bull., Wash., 1921, xv, 139-173, port.

³⁸ P. Myrdacz: Sanitäts-Geschichte des Feldzuges 1859 in Italien. Wien, 1896.

panies, but their medical administration in the field broke down through the fact that the chief surgeons of the two armies were mewed up in general headquarters and not allowed to have access to the field commanders, so that there was no centralized direction for relief of the wounded. In the French army the chief surgeon, Baron F. X. Larrey, jr., was under the thumb of the general intendant at Paris, the real executive, to whom Larrey could only submit "propositions," with the usual deplorable effects upon field medical administration. The correspondence between Paris and Larrey, published by Chenu, shows how sorely the chief surgeon's patience was tried by this short-coating. The natural sequels of this irritating decentralization came to a head on the bloody field of Solferino, where the *débâcle* of relief of the wounded was complete and disgraceful. Out of all this came one great good. In 1862 Henri Dunant (1828-1910), an eye-witness of this battle, published "*Un Souvenir de Solferino*," and his account of its horrors led to an International Conference of the Red Cross Societies at Geneva in 1863 and to the Geneva Convention of August 22, 1864, in virtue of which the fourteen signatories pledged their respective nations to regard the sick and wounded, as also the army medical and nursing staffs, as neutrals on the battle-field. This Convention was observed all over the world up to the European War.

*The Civil War*³⁹

Lynch has defined the period 1865-98 as "the day of small things in the United States Army." In the period 1800-61 there was but little advance made in medical administration over the methods used in the Revolution, when, as Hoff says, "all that our people knew of military affairs came from the British." The policy followed at the conclusion of each war was the then current English plan of cutting down the Army and Medical Corps to an irreducible minimum. During this period our small army was distributed in small commands, stationed at isolated and widely scattered posts, at which the business of the medical officer was confined to routine duties and practice at the post or among the civilian population. The effect was sometimes to produce the enslaved or discontinuous mind, the habit of thinking in petty terms, of interpreting the letter rather than the spirit of Regulations. The Civil War found the government unprepared, with the necessity of beginning a gigantic contest with undisciplined, inexperienced volunteers, and with many of the fine flower of the West Pointers gone over to the South. The earlier failures of the Union forces were obviously due to incompetent, dilatory generalship and to narrow adherence to worn-out routine in the central administration. In the eyes of foreign military authorities the Civil War has little teaching value, except as demonstrating that armies voluntarily enlisted for a war period, "while capable of unexcelled feats of endurance" are "incapable of forcing a swift decision," an alternative which usually

³⁹ United States, War Department, Surgeon General's Office. Medical and Surgical History of the War of the Rebellion. 6 vols. Washington, 1870-83. L. C. Duncan: The Medical Department of the United States Army during the Civil War, Washington, 1914.

proves an expensive luxury as far as the lives and financial resources of tax-payers are concerned.⁴⁰

Letterman

Given the size of the armies raised, the medical arrangements for evacuation and care of the wounded were meagre. There was no organized ambulance or field hospital service, no organization for evacuation to the interior where hospital service was hastily improvised in hotels, barns and neighboring private houses. The introduction of rifled arms, with fixed ammunition and conoidal bullets, had vastly increased the range and rapidity of fire, with much wider danger-zones and greater scattering of the wounded over the field. As the engagements increased in magnitude, the wounded lay helpless on the battle-fields for hours extending to days before the slow work of evacuation was completed. Duncan relates that, on two occasions, evacuation to Washington was attempted by commandeering 100 rickety hacks and hucksters' wagons from that city.⁴¹ The teamsters driving army wagons were drunken, insolent and insubordinate. There was no effective bridge in the way of sanitary formations operating between front and base to relieve commands overwhelmed with casualties. This not only caused immense suffering and losses among the wounded, but interfered with the mobility of fighting units through delays and stalling of vehicles, sometimes demoralized commands as to fighting capacity, and encouraged skulkers to desert the lines under pretext of assisting the wounded to the rear. All this was changed by the advent of Jonathan Letterman (1824-72), who succeeded Tripler as medical director of the Army of the Potomac on June 19, 1862, and whose genius for medical administration brought about the epoch-making reforms which became a pattern for all subsequent armies and eventually fixed principles in our own.⁴² In his capacity for thinking in large terms, Letterman was very adequately encouraged by his military chiefs McClellan and Hammond, whose letter of June 19 commits to him "the health, the comfort and the lives of thousands of our fellow-soldiers."

On August 2, 1862 Letterman's plan for an Ambulance Corps was at once put into effect in the field by McClellan's General Orders of that date, further amplified in G. O. of August 24, approved by Hammond (September 7), adopted by Grant in the West (G. O. March 30, 1863) and, although disapproved by Halleck and Stanton, eventually incorporated by Congress in the Act of March 11, 1865. It provided for an ambulance corps for each army corps, with two-horse vehicles provided with 2 litters each, in the proportion of 3 for each regiment of 500. The corps was officered by a captain as com-

⁴⁰ Atkinson: *op. cit.*, 603; 623.

⁴¹ Duncan: *op. cit.*, 34; 36-38; 43.

⁴² Letterman: *Medical Recollections of the Army of the Potomac*. New York, 1866. *Medical and Surgical History of the War of the Rebellion*. Surg. vol. pt. iii, Washington, 1883, 923-986.

mandant, with 1 lieutenant for each division or brigade, 1 sergeant for each regiment, 2 privates and 1 driver to each ambulance and 1 driver to each medicine wagon. The personnel, detailed from the line to secure well-disciplined men at the start, was under sole control of the medical director; provisions for drill of the corps, parking and disposition of the vehicles in the train were made, and use of the ambulances for any other purpose than evacuation was forbidden. Letterman's system was first tried out at the battle of Antietam (September 17, 1863), and here, as medical director of an army of 100,000, he was able to demonstrate its worth in the face of great difficulties in obtaining ambulances, equipment and supplies. At the first Bull Run one-half (550) of the 1,100 Union wounded had been sent to Richmond as prisoners, the rest reaching the lines at Arlington on foot or in vehicles as best they could. At Cedar Mountain some of the 1,445 wounded remained on the field for 36 hours, at Manassas the wounded remained on the field all night before evacuation. On the march to Antietam Letterman had collected supplies and some 300 ambulances four days before, and although the battle line was 6 miles long and the number of wounded 10,000, all had been collected and sheltered inside of 24 hours. Soon after Antietam Letterman attacked the problem of supplies, which under the old regimental system of distribution, were either in excess of requirements or deficient, and in the former case, came to be recklessly wasted when their bulk made them impedimenta on a march or in retreat. In his circular (with supply-table) of October, 4, 1862 (revised September 3, 1863) Letterman changed all this by an economic selection of the amounts of different medicines and matériel to be transported, and thus reduced the number of supply wagons by nearly one-half. Under the old system there were stationary regimental (tent) hospitals and base hospitals improvised in large buildings in interior towns. Letterman's Circular of October 30, 1862 introduced his third great improvement in medical administration, viz., mobile field hospitals, consisting of tents and equipment, manned by appropriate medical and surgical personnel, for receiving and treating the wounded evacuated from the lines prior to ultimate evacuation to base. With the aid of these hospitals and the ambulance companies the great gap between front and base was bridged, and it became possible to relieve and treat the wounded during battle. Letterman's ambulance organization continued to gain in efficiency in such major battles as Fredericksburg, Gettysburg and Chickamauga, but his completed system was not in full swing until the beginning of Grant's and Sherman's campaigns of 1864, in which it reached its height of perfection. The 200 ambulances constructed early in 1861, before Letterman's detail, were light two-wheeled carts of the old Larrey type, which gave the wounded intolerable discomfort by their rocking motions and were soon displaced by capacious four-wheelers of varied type. The litters employed were of canvas stretched across two poles. Freight and passenger cars were converted into hospital cars with three stories of berths on either side. Steamboats and steamships were employed for water transportation. The base hospitals, both Union and Confederate, were at first located in adjacent hotels, churches, factories, warehouses, schools, academies and private dwellings, e. g., the National Hotel, Georgetown College and Odd Fellows Hall, D. C. (1861), or the Tishomingo Hotel (Corinth, Miss.). As the wounded poured in from the great battles, additional wards were constructed around these buildings as nuclei and finally separate groups of ridge-ventilated wooden pavillions were constructed, of one story each, arranged in geometric figures around a central administration building and connected by covered passageways, the originals of our base hospitals in the recent war. The first of these was the large wooden structure erected at Parkersburg, Va. (1862). Some of them, such as the Satterlee (West Philadelphia) or the Mower at Chestnut Hill, had over 3,000 bed capacity.⁴³ In these advances in ambulance and supply service and

⁴³ For the hospitals, see *Med. & Surg. Hist. (etc.) Med. vol. pt. iii, Wash., 1888, 896-966.*

hospitalization, much was due to the propagandism of the Sanitary Commission (organized June 9, 1861) and the Christian Commission. Although these organizations were inclined to magnify and overestimate their importance, they were undoubtedly the main sources of food, medicines, clothing and other much needed supplies during the early period of the war. A questionnaire for hospital inspectors had been devised by Tripler, but the Sanitary Commission was also instrumental in forwarding sanitary inspection of camps and hospitals. In 1864 the medical organization included divisional medical directors and medical inspectors, chief surgeons of divisions, brigades and division hospitals, divisional attending surgeons, regimental assistant surgeons, and commanders of divisional and brigade ambulance companies.⁴⁴ Acting assistant or contract surgeons were employed for special duties, and among the volunteer medical personnel many of these were detailed on part-time service, continuing practice in their home cities. Hammond's Circular of May 21, 1862 (No. 2 S. G. O.) ordered more exact and detailed reports of the sick and wounded and the diligent collection of pathological specimens, projectiles, etc., from the battlefields, resulting in the foundation of the Army Medical Museum (August 1, 1862). Hammond also projected an Army Medical School, but this was discouraged by Stanton. The Medical and Surgical History of the War, adumbrated in Hammond's circular of May 21, 1862 and edited up to 1884 by Joseph J. Woodward and Charles O. Otis, was completed after Woodward's death by Otis, Charles Smart and David L. Huntington, and published, in six massive volumes, during 1870-88. This work received at once the high commendation of Virchow and other European authorities and was undoubtedly the most important contribution to military medicine and surgery yet made. The medical statistics of the war were not published in the Surgeon General's Annual Reports during 1861-2, but in the history of the war, which contains the records of the brilliant work done in the medical conduct of the war by Letterman, McParlin, Woodward, Otis Billings, Woodhull and others.

Battle Losses in the Civil War

The losses among the Union forces were 44,238 killed in battle, 49,731 died of wounds, 186,216 died of disease, 24,184 died of unknown causes (total, 304,369). A later A. G. O. estimate gives 67,058 killed, 43,012 died of wounds, 224,586 diseases, and 24,942 unknown causes (total, 359,598). The Confederate losses were: Killed in action 94,000; died of disease 59,297; losses in prisoners and deserters 188,372 out of 781,192. For the killed, wounded and missing on both sides in all the battles and engagements from April 12, 1861 to May 26, 1865 see Surgical Volume (Part I) of the Medical and Surgical History of the War (1870), pp. XXXIV—CXL.

The losses in the principal battles were:

Bull Run (July 21, 1861): Union, 481 killed, 1,011 wounded and 1,460 missing; Confederate, 269 killed, 1,483 wounded.

Seven days before Richmond (June 26th to July 1, 1862): Union, 1,582 killed, 7,709 wounded and 5,958 missing; Confederate, 2,820 killed, 14,011 wounded and 752 missing.

Cedar Mountain (Aug. 9, 1862): Union, 450 killed; 660 wounded, and 290 missing; Confederate, 229 killed, 1,047 wounded and 31 missing.

Bull Run (2d) (Aug. 30, 1862): Union, 800 killed, 4,000 wounded and 3,000 missing; Confederate, 700 killed, 3,000 wounded.

Antietam (Sept. 17, 1862): Union, 2,010 killed, 9,416 wounded and 1,043 missing; Confederate, 3,500 killed, 16,399 wounded and 6,000 missing.

⁴⁴ For the duties of these officers in campaign, see, Med. & Surg. Hist. (etc.) Surg. Vol. pt. iii, Wash., 1883, 899-914.

Fredericksburg (Dec. 13, 1862): Union, 1,180 killed, 9,028 wounded and 2,145 missing; Confederate, 579 killed, 3,870 wounded and 127 missing.

Chancellorsville (May 1-4, 1863): Union, 1,512 killed, 9,518 wounded and 5,000 missing; Confederate, 1,581 killed, 8,700 wounded and 2,000 missing.

Gettysburg (July 1-3, 1863): Union, 2,834 killed, 13,709 wounded and 6,643 missing; Confederate, 3,500 killed, 14,500 wounded and 13,621 missing.

Wilderness (May 5-7, 1864): Union, 3,288 killed, 9,278 wounded and 6,784 missing; Confederate, 2,000 killed, 6,000 wounded and 3,400 missing.

Cold Harbor (June 1-12, 1864): Union, 1,905 killed, 10,570 wounded and 2,456 missing; Confederate, 1,200 wounded and 500 missing.

Kenesaw Mountain (June 9-30, 1864): Union, 1,370 killed, 6,500 wounded and 800 missing; Confederate, 110 killed and wounded, 3,500 missing.

Petersburg (June 15-19, 1864): Union, 1,298 killed, 7,474 wounded and 1,814 missing.

Atlanta (Hood's first sortie) (July 22, 1864): Union, 500 killed, 2,141 wounded and 1,000 missing; Confederate, 2,482 killed, 4,000 wounded and 2,017 missing.

*The Seven Weeks War*⁴⁵

In the Seven Weeks War (1866) the advantages of breech-loading over muzzle-loading weapons were demonstrated for the first time. The Austrian Army of the North, numbering 328,168 men, was armed with old-fashioned muzzle-loading rifled artillery carrying the case-shot (shrapnel) of the Napoleonic wars. The Prussian army confronting them, numbering 302,134, was armed with breech-loading rifled cannon and with breech-loading needle guns sighted to 400 yards. But although the Austrians were esteemed superior to their adversaries, their troops had to load standing up, which gave their opponents a distinct advantage, while the Prussians were superior in physique, training and general staff work. The Austrians were easily picked off by the long range rifles of the enemy, who could now creep up inside the artillery range and fire lying down, thus nullifying the effect of case-shot. In the battles of June 26-July 22 the Austrians lost 10,070 killed, 29,675 wounded, 13,330 missing; the Prussians 3,439 killed, 12,491 wounded, 702 missing. Cholera, typhus fever and dysentery were very prevalent at this time and were spread through Prussia, Saxony, Bohemia and Moravia by the invading army. The Prussians had 64,191 sick, of whom 5,219 died, 39,258 were discharged and 19,714 remained in hospital. This condition occasioned a sharp critique of the Prussian sanitary administration by army surgeon, G. F. F. Loeffler, the historian of the war (1868).⁴⁶ Loeffler pointed out that the mortality of 10½ per cent among the wounded in the different battles and of 11½ per cent at Königgratz, as also the sick lists, while an improvement on the past, were a measure of sanitary inefficiency. Meanwhile, in consequence of these conditions, the king called a conference of the leading military surgeons of Prussia, which lasted from March 18 to May 5, 1867 and resulted in a complete reorganization of the medical service of the Prussian Army, including the expansion of voluntary first aid in accordance with the Geneva Convention of August 22, 1864.

*The Franco-Prussian War*⁴⁷

In this war, the most remarkable example in recent times of a campaign adroitly motivated, suddenly precipitated and brought to a

⁴⁵ P. Myrdacz: *Sanitäts-Geschichte der Feldzüge 1864 und 1866*. Wien, 1897. F. H. Garrison: *Mil. Surgeon*, Wash., 1917, xli, 711-717.

⁴⁶ F. Loeffler: *Das preussische Militär-Sanitätswesen and seine Reform nach der Kriegeserfahrung von 1866*. Berlin, 1868.

⁴⁷ P. Myrdacz & J. Steiner: *Sanitäts-Geschichte des deutsch-französischen Krieges 1870-71*. Wien, 1896.

speedy conclusion by "short, sharp and decisive" action, the Prussians profited by the lessons learned in 1866. They entered upon the campaign fully prepared, mobilized their entire forces in 8 days (July 16-24, 1870) and concluded the war in five months on January 28, 1871. There is no question that the French labored under the disadvantages of inferior leadership, poor training, faulty equipment, and the cumbersome methods of their bureaucracy.

During the war the French forces were increased from 244,828 to 534,000 (total mobilization 800,000), the German from 384,000 to a mean strength of 788,213 (total mobilization 1,113,700). The French medical organization was that of 1854-9; the total number of medical officers being 1,020 or 127 less than required in the cadre. The directors of administration in the field were the *médecin inspecteur* (for the whole army) and a *médecin principal* for each army corps. Each army corps and each division had its own ambulance service manned by 4-5 physicians and 20 nurses, with wagons and animals, but no litter-bearers. Evacuation of the wounded was assigned usually to troops detailed from the line. First aid stations were manned by the battalion physician and bandagers behind the firing lines. Division ambulances were posted 4 km. beyond, corps ambulances further back, transportation being effected with the ambulances on hand and by other vehicles available. The Prussians had a much larger medical personnel, viz., 3,853 medical officers, eventually raised to 5,548 from civil life, 5,858 hospital attendants, 2,921 nurses, 468 apothecaries.

The medical administration in the Prussian War Department was directed by the Surgeon General (H. G. Grimm). The cadre of the field formations included a chief surgeon for each army, corps surgeons for the separate corps, division surgeons, regimental surgeons, battalion surgeons, with chief staff surgeons, staff surgeons and assistant surgeons for the cavalry and artillery. Each mobile army corps had a surgical consultant, 3 sanitary detachments manned by 2 staff surgeons, 5 assistant surgeons and 124 litter bearers, and 12 field hospitals (officered by a staff surgeon and 3 assistant surgeons). The Saxon, Bavarian, Württemberg and Baden army corps had similar cadres. The lessons taught by Larrey and Letterman had been well learned. The mobile sanitary formations of these armies were as follows:

North German Confederation: 43 sanitary detachments, 170 field hospitals, 45 sections reserve hospital personnel, 16 hospital reserve depots.

Bavaria: 4 sanitary companies, 12 receiving field hospitals, 4 main field hospitals.

Württemberg: 4 field sanitary trains, 6 field hospitals, 1 hospital reserve depot.

Baden: 1 sanitary detachment, 5 field hospitals, 2 sections reserve hospital personnel, 1 hospital reserve depot.

Evacuation of the wounded was managed as follows: the officers led the litter bearer companies into the battle lines in two detachments consisting each of 5 patrols, and 3 litters each manned by 4 bearers (2 alternates for long distance evacuation). The wounded were collected, given first aid and refreshments where possible, and rapidly conveyed to the ambulances assembled at nearby stations, which carried them to the main dressing-station, whence they were taken to the field hospitals by ambulances belonging to other detachments or any available vehicles. When the ambulances near the firing lines were in motion to and fro, the litter-bearers conveyed the wounded directly to the main dressing station, whence the slightly wounded proceeded on foot to the field hospitals. The severely wounded were then sent to evacuation hospitals (*Etappenlazarette*), and thence to the base or barrack hospitals which usually had to be built, as only 162 tents were available in the Prussian Army. The large general hospitals in the cities were sometimes quadrangu-

lar and sometimes V-shaped (as at Hamburg [Altona] and Mannheim) or M-shaped (as on the Tempelhof in Berlin), with the administration and other buildings in a perpendicular line let fall from the central angle. There was a large organization for voluntary nursing in the cities, patronized by the élite. The French arrangements for evacuation in the field followed the modern lines, but were deficient in personnel and matériel, while there had been no preparation for hospitalization in the interior. Assistance to the wounded in the cities was eked out by charity of the public spirited and by voluntary nursing organizations. There were also volunteer sanitary formations in the field, such as the Anglo-American Ambulance organized by the American gynæcologist, Marion Sims. The German hospitals in the zone of advance handled 468,487 sick and 92,164 wounded and of these about 250,000 were evacuated to the interior. Chenu computes that the French had 131,000 wounded and 339,421 sick (total 609,961), of whom there were 136,540 killed, missing and died from wounds and disease. The Germans had 116,826 killed and wounded out of 788,213 mean strength (148.2 per 1,000) and of these 17,255 were killed and 11,023 died of wounds. Some 475,000 sick were admitted to hospital, of whom 14,904 eventually died. This was, therefore, the first war of magnitude in which the mortality from battle casualties (among the Germans) exceeded that from disease. The most fatal communicable diseases were typhus and typhoid fevers, smallpox, and dysentery. This campaign afforded a scientific proof of the value of Jennerian vaccination. Among the German troops, who had been vaccinated and revaccinated, the smallpox incidence was 4,835 cases, with 278 deaths; among the French prisoners, only part of whom had been vaccinated, it was 14,178 cases, with 1,963 deaths. An elaborate official history of the Prussian Army medical department in the war was published in 1884-90.⁴⁸

The losses in the different battles were:⁴⁹

Wörth (August 6, 1870): French, 17,000 killed, wounded and missing out of 50,000; Germans, 10,643 out of 120,000.

Spicheren (August 16): French, 3,976; Germans, 4,872.

Colombey (Borny) (August 4): French, 3,608 out of 84,000; Germans, 4,907 out of 57,000.

Vionville (Mars la Tour) (August 16): French, 17,231 out of 113,000; Germans, 15,800 out of 63,000.

Gravelotte (August 18): French, 12,275 out of 140,000; Germans, 20,173 out of 188,000.

Beaumont (August 30): French 4,800; Germans, 5,534.

Sedan (September 1): French, 14,000 out of 120,000; Germans, 8,931 out of 220,000.

Noisseville (September 1): French, 3,542; Germans, 2,978.

*The Russo-Turkish War (1877-78)*⁵⁰

This war (1877-78) is of interest as establishing the value of intrenchments and field works in securing invisibility against artillery fire. The spade was freely used on both sides as the Turks were armed with Krupp breech-loaders (artillery), Martini rifles (infantry) and Winchester carbines (cavalry). The Turks were better armed and proved to be better fighters, but they had no such generals as Skobelev and Todleben, and their commanders were overridden by their politicians at Constantinople "with the disasters which invariably follow the attempt of civilian amateurs to control warlike operations" (Crowe). The only decisive battles were the Russian defeats at Plevna (1877), with Russian losses

⁴⁸ Germany: *Kriegsministerium, Sanitäts-Bericht über die deutschen Heere im Kriege gegen Frankreich 1870-71*. 7 vol. in 11 pts. Berlin, 1884-90.

⁴⁹ Myrdacz: *op. cit.*, *passim*.

⁵⁰ P. Myrdacz: *Sanitäts-Geschichte des russisch-türkischen Krieges 1877-78*. Wien, 1

of 2,898 and 7,338 on July 20 and 30, the fall of Plevna and the Turkish rout at Philippopolis (1878). In the Turkish army of 363,000 men there was no organization for evacuation of the wounded, who were taken out of the lines by comrades. The Russians had an organized medical corps, ambulances and litter-bearers, "temporary war (field) hospitals," troop and division hospitals, retreats for the light sick and slightly wounded (*okolotki*) and large general hospitals in the cities of the interior helped out by the voluntary nursing organization of the Russian Red Cross; but their losses from typhus, dysentery and battle casualties were heavy, viz:

Army of the Danube (592,085 men): 11,905 killed, 43,386 wounded, 4,955 died of wounds; admissions to hospital, 951,993; died of disease, 50,464; deaths from typhus and typhoid, 23,752 out of 135,239 cases; deaths from dysentery, 9,543 out of 43,386 cases.

Army of the Caucasus (mean strength 246,454): 13,266 wounded; 1,869 died of wounds; admissions to hospital, 1,198,023; died of disease, 34,877; deaths from typhus and typhoid, 20,233 out of 64,298 cases; deaths from dysentery, 3,552 out of 22,984 cases.

*Military Surgery in the 19th Century*⁵¹

The wars of the 19th century drew into the military service some of the greatest surgeons of the period. Larrey, Percy, Hennen, Guthrie, Dieffenbach, the elder Langenbeck and the elder Graefe served in the Napoleonic Wars, of which Larrey's "Mémoires de médecine militaire" (1812-17) is the most enduring surgical memorial. Sir Charles Bell attended the wounded after Corunna and Waterloo; Dupuytren those from the July Revolution of 1830. John Hennen's surgical treatise of 1818 is a valuable surgical record of the Napoleonic period. Blandin rendered service in Algeria, Velpeau and Jobert de Lamballe looked after the casualties of the February Revolution of 1848. Esmarch and Stromeyer served in the campaigns of 1849-51, 1864-6 and 1870. The great name of Pirogoff is associated with the Crimean and Russo-Turkish Wars. W. W. Keen, Weir Mitchell, Morehouse, J. M. DaCosta, Otis, Billings and Hunter McGuire were prominent in the Civil War. Bilioth, Langenbeck, jr., Volkmann, Esmarch, Gurlt, von Bergmann, Bardeleben, Wilms, Czerny, Nussbaum, and the elder Loeffler served in the Franco-Prussian War.

The military surgery of the century underwent profound changes in consequence of the introduction of ether and chloroform anæsthesia (1847), surgical antisepsis (1867) and the many improvements in weapons and missiles. The great discovery of Röntgen (1895) was already to prove its worth in the Spanish-American War (1898-9). Ether was immediately taken up by Pirogoff and Syme (1847) and in the same year it was also employed in the Mexican War. The supreme advantage conferred upon the military surgeon by anæsthesia was not merely in the banishment of pain, the disconcerting cries and struggles of the patient, but in the complete abolition of slap-dash operating. Under the older conditions the patient had to be held by several persons, fortified by stimulants and moral encouragement, or even stupefied by opiates to the limit of tolerance, as in the case of Astley Cooper's attempt to tie the subclavian (1809).⁵² Brilliant surgeons like Fergusson, Pirogoff or the elder Langenbeck became sleight-of-hand operators, whisking off a limb before the patient realized it. With the aid of anaesthesia the operator in the

⁵¹ For the history of modern military surgery, see E. Richter: *Allgemeine Chirurgie der Schussverletzungen im Kriege*, Breslau, 1877 (with admirable sections on the history of military medicine in fine print). Also, Bock & Hasenknopf: *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Berl., Heft 18, 1901, 45-155; Heft 24, 1904, 1-178; Heft 27, 1904, 43-385.

⁵² Described by Valentine Mott in: *Med. Repository*, N. Y., 1809-10, xiii, 331-334. It is highly probable that opiates were administered before 1847 in more major operations than we know of. The advantages in ligations of the larger arteries or in any operation in which a slip of the surgeon's hand might end the struggling patient's life, are self-evident.

field could proceed with the same careful, deliberate precision as in his own clinic, and in consequence almost any regional surgery could now be attempted, except in the dangerous hollow cavities. But on the battlefield and in hospital sepsis, wound infection, gangrene, tetanus and erysipelas still proved the bane of surgery and occasioned a dreadful mortality in wartime. The discoveries of Pasteur and Lister (1867) created the newer surgery. At the outbreak of the Franco-Prussian War the military applications of antisepsis were set forth by Lister himself in his paper of 1870,⁵³ and the end of the war (1871) saw his method firmly established in the field by Volkmann, Mikulicz, Thiersch and others. Lister's tour through Germany in 1875 was in the nature of a triumphal progress. The introduction of steam sterilization of instruments (1886) and of general asepsis (1891) by Ernst von Bergmann added the copingstone to the edifice. The stethoscope (1819), the hypodermic syringe, of which various types had been invented by F. Rynd (1845), C. G. Pravaz (1851) and A. Wood (1855), and the clinical thermometer, although known, were regarded as clinical curiosities and did not become a part of general hospital and military practice until about 1866-70. Billings was one of the few medical officers who had a hypodermic kit in the Civil War. It was during the last three decades of the 19th century in fact, that medical and surgical practice began to acquire something of a scientific status. After 1885 small firearms began to diminish in weight, length and caliber of barrel, magazine or rapid fire guns were substituted for the single loader, and in consequence smokeless powder came into use to prevent fouling of the barrel from rapidly repeated discharges. To adapt soft leaden bullets to the rifling in rapid firing at high velocity, it became necessary to jacket the leaden core with some smoother, harder metal, while at the same time, to attain a high velocity and to overcome resistance, the projectile was decreased in caliber and weight and increased in length. Weapons were produced which could deliver 40 shots a minute at a range of 4,000 yards with missiles of extraordinary penetrating power, while improvements in sighting made for uncanny marksmanship. Thus a new kind of warfare was introduced with projectiles which, at long range, either killed outright or, if not attaining a vital spot, produced a small, clean-cut wound with little shock and greater chance of recovery. The old, larger calibre bullet, with larger wounds and greater shock, was more effective in stopping charges at a certain range. In cases of fracture of the long bones the small calibre bullet is capable of producing terrible laceration of the soft parts and extensive splintering, simple perforations of flat bones or empty hollow viscera, and the usual explosive effects in the brain or the filled stomach. All this led to experimental studies of wounds by small-calibre projectiles, the relatively benign nature of which had been pointed out by Verneuil in 1867. But in 1902 La Garde demonstrated that pathogenic organisms in powder or on bullets are not destroyed by the heat of firing, so that, as the European War proved, we can no longer rely upon the theory of sterile gunshot wounds. They are not "poisoned" as those before Paré thought, but usually infected. Until the days of trench-warfare operative surgery on the front line was virtually banished from the battlefield. The changes rung upon treatment of gunshot wounds and fractures in the light of studies of the newer projectiles, the newer orthopedics from Delpech and Stromeyer to Thomas, Sayre and Hoffa, the military surgery of the nervous system, the chest, the viscera, the genito-urinary system, constitute a field too vast for exposition here. Wound-incision known to Paré was converted by Larrey into wound excision (*débridement préventif*), as we now know it. After his time it fell into abeyance until the European War. The revival of routine and sometimes reckless amputation necessitated the invention of many new varieties of orthopedic appliances and artificial limbs.

⁵³ Lister: Brit. Med. Jour., London, 1870, ii, 243.

Military Sanitation in the 19th Century

Of medicine Napoleon said contemptuously "Water, air and cleanliness are the chief articles in my pharmacopœia." This rule-of-thumb hygiene, based upon folk-intuition and cult-cleanliness, was all that could be had before the time of Pasteur and Koch. The Romans drained swamps without knowing why, and the spirit that informed Charles White's midwifery treatise of 1773 could not make obstetric procedure aseptic except, perhaps, in his own practice. To go beyond the excellent rules of military hygiene laid down by Pringle (1752) and Brocklesby (1764), something more was needed, something not to be found in the excellent treatise of E. A. Parkes (1864) written at the instance of Sidney Herbert, nor in Pettenkofer's experimental data upon air, water, the soil, etc., upon which such treatises were usually based. The new stimulus came from the data of bacteriology which, as Flexner said, "transformed hygiene from an empirical art into an experimental science." In the middle period, prior to the foundation of Koch's Institute for Infectious Diseases (1891) in Berlin, some clever things were done. John Snow, who checked the spread of water-borne cholera in London by taking off the handle of the Broad Street pump (1854), and William Budd, who stopped the rinderpest of 1866 "with a poleaxe and a pit of quicklime," both knew how to prevent epidemics, and William Farr had already evolved curves from which their course might be predicted (1840-66); but the real change came with the application of Koch's ideas in stopping water-borne cholera at Hamburg by proper filtration (1892-3). This was the starting point of the newer preventive medicine, in which to ascertain the mode of transmission of a disease is more important than to discover its cause, and in which we no longer wait for the disease to occur but attack its transmitting agents beforehand. This did not become apparent until long after Manson's discovery of the mosquito as a vector of *Filaria* (1879) and Laveran's discovery of the parasite of malarial fever (1880). It was the demonstration of the malarial parasite in the mosquito by Sir Ronald Ross (1897-8) which established the theory of insect-borne diseases in practical sanitation. The brilliant results in mosquito-control obtained by Ross in Africa (1899-1902) and by Gorgas in Havana (1901) and Panama (1904-13) made this method a fixed procedure in military hygiene. The discovery of immune human carriers in typhoidal and other infections revolutionized the whole science of disease prevention. The carrier, the contact and the suspect now became more dangerous to the community than the disease itself, and it was perceived that there can be no real prophylaxis in venereal diseases without control of the

male as well as the female carrier. Meanwhile, in consequence of the scientific development of food chemistry, metabolism, heating, ventilation and disinfection, the enlisted man's ration, housing and hospitalization came to be studied from a more enlightened point of view. The exhibits of 19th century uniforms at the Dresden Hygienic Exposition (1911) showed how long the soldier continued to be made miserable by the heavy shakos, helmets, tight collars and burdensome equipment and weapons of the past.

*Prostitution and Venereal Diseases*⁵⁴

It was from the data of bacteriology and parasitology that the sanitarian began to get his first glimmerings of the real social significance of venereal infections as opposed to the older theological concept, but he was not destined to see the venereal carrier as he saw the carriers of phthisis, dysentery or influenza until the time of Schaudinn, Wassermann and Ehrlich (1905-10). Meanwhile the management of venery and venereal infection in armies continued along conventional lines, with the new device of virtual conscription of prostitutes by police control. The Roman and German plan of forestalling infection from promiscuity by domesticating soldiers' wives in regiments (the analogue of the safe and secret societies for intersexual relations which existed among the aristocracy before the Revolution) broke down under the newer doctrines of the political equality of all men and women before the law, and the dignity of industrialism. A Prussian Regulation of August 8, 1835 directs all civil and military physicians to report infected prostitutes to police headquarters for purposes of control. A Cabinet Order of 1844 ordered all brothels in Berlin to be closed by January 1, 1846, but the only result was to multiply novel methods of clandestine prostitution among the civil population, so that the number of syphilitics in 1846-7 was greater than in 1844-5. The brothels were reopened in 1851 under police control, to be closed again in 1856. The only new feature in subsequent regulations was "restriction of relations of the military with the civilian population" (order of January 27, 1907). In France events took about the same course. Napoleon patronized "control" in his usual superficial way, e. g., in his "magnificent gesture" to Bernadotte: "*Je vous félicite sur votre règlement sur les femmes. C'est un abus à proscrire.*" In the Regulations of the port of Brest (1830) soldiers were ordered to report all known infected women. A Belgian order of 1842 even authorized punishment of soldiers withholding the names of such women. Closure of brothels in garrison towns was sometimes circumvented by the threats of commanding

⁵⁴Haberling: Ztschr. f. Bekämpf. d. Geschlechtskr., Leipz., 1915, XV, 332-358.

officers to have their troops removed. The military portion of Parent-Duchatelet's great report on prostitution in the city of Paris (3d edition 1857)⁵⁵ is the only close analysis of causes and effects and should be read by all medical officers on account of its freedom from cant, its statement of things as they are, and its robust common sense. During the Civil War medical (as differentiated from police) control was introduced with such entire success at Nashville and Memphis that, as Surgeon Robert Fletcher reported,⁵⁶ the women became "earnest advocates of a system which protects their health and delivers them from the extortions of quacks and charlatans." In England the Contagious Diseases Act of June 11, 1866 required every public prostitute at a naval or military station to be examined in a dispensary, and if infected, to be placed in a government hospital for treatment. This Act, obviously fair and scientific in intention, was shown to have had a remarkable effect in lowering the rates of venereal infection during the 17 years of its operation, since, in the military scheme of things, it became possible to control both male and female carriers; but due to the peculiar bias of Anglo-Saxon sentiment it was abolished in the House of Commons on motion of Mr. Stansfeld, on April 21, 1883. Thereafter the only course open to the military authorities was the hypocrisy of apparent compliance with public opinion set off by occasional recourse to such measures as had undoubtedly been employed before the passage of the Act and had led to its formulation. Meanwhile Darwinism and other phases of biological doctrine had tended to strip away the garments of pious make-believe from many aspects of the nature of man, particularly normal sexuality; while at the same time a prominent effect of this novel reasoning was to break down the restrictions upon which social morality is based and the religious sanction which had given it emotional force in the past. Since morality is only an inhibition at best, it came to be regarded as admirable that people should "struggle" for their existence, and he who did not display strenuousness in attempting to outdo and belittle his neighbor was rated as a weakling. Police control of prostitution (the worst possible kind of control) came to be exploited by the corrupt politicians of cities as a means of graft, and in Eastern Europe unfortunate and poverty-stricken women were bullied into prostitution by the police or shipped as merchandise to distant ports. There arose the monstrous doctrine that human beings can be bettered from without rather than from within. For the brutalizing effects of this "struggle-for-life" theory of existence civilized humanity was to pay a terrible penalty in the episode of the

⁵⁵ Parent-Duchatelet: *De la prostitution dans la ville de Paris*. 3. éd. Paris, 1857, I, 541.

⁵⁶ *Med. & Surg. History of the War*. Med. Vol. Pt. III, Wash., 1888, 891-896.

European War, which brought to a striking focus the problem of sexuality and venereal control.

*The Spanish-American War*⁵⁷

The Spanish-American War (1898) was fought mainly upon the sea, and the total battle-casualties were slight, viz., in the Navy 1 officer, 17 men killed; in the Army 22 officers, 244 men killed, 275 died from wounds or accidents out of a mean average strength of 235,631. Some 3,450 died of disease due mainly to an epidemic of typhoid fever among the troops at the camps at Chickamauga and Montauk Point. The military forces in Cuba, Porto Rico and the Philippines accomplished what they set out to do in good time and without difficulty, but the severe incidence of malarial and yellow fevers among the troops in Cuba necessitated withdrawal of the army from that island once the main object of the expedition had been accomplished, and the volunteer medical personnel in the American camps was not equal to the task of coping with the typhoid epidemic. This break-down in medical administration was due in part to the meagre equipment and personnel allotted the army on a peace footing, and to the fact that the war was entered upon, after the usual fashion of Anglo-Saxon nations, without previous planning or forethought. The findings of the Dodge Commission appointed by the President to investigate the conduct of the war resulted in certain important changes in the organization of the Medical Department, to which Surgeon General Robert M. O'Reilly (1845-1912) devoted his administration (1902-9), and which were to prove the main factors of success in our medical arrangements for the pan-European War. To understand the significance of these it is necessary to go back a little.

In the earlier period William Beaumont (1785-1853) performed, in the back-woods of Michigan, those epoch-making experiments on gastric digestion and on dietetic scales (1824-33) which made him the founder of physiology in our country. But in these early days our diminutive army was mainly occupied in nursing along and developing the frontier civilization of the great West, that almost unknown phase of its service to which Sir Richard Burton paid sympathetic tribute⁵⁸ and which McCaw has eloquently described.⁵⁹

"Our small regular army has never received from our people the credit due for its long and patient work in helping to build up the civilization of the great West. The army has never been a band of idlers, fattening upon the Treasury and waiting for wars that never came. There has never been a time that the army was not actually doing something for the people. The fringe of the civilization of the West grew steadily forward under the shadow of line upon line of little military stations. The plains and hills, where

⁵⁷ G. M. Sternberg: Jour. Am. Med. Ass., 1898, xxxi, 1356-1360. Also: Ann. Rep. Surg. Gen. U. S. Army for 1898 and 1899.

⁵⁸ Sir R. Burton: The City of the Saints, London, 1861.

⁵⁹ W. D. McCaw: From address delivered at the banquet to Gen. Sternberg, June 8, 1908.

the Indian sounded his war-whoop and the coyote ranged at will, are now covered by farms and pastures, by cottages and mansions, with a sturdy and prosperous people. When one goes West now for the first time in a palace car and sees the Stars and Stripes floating over many a school-house, he can form no idea of the long and perilous journey of former days by stage coach, by wagon train or on horseback, and the comfort that the same flag brought when it was sighted above the little camp or cantonment. Under the protection of the forts grew up humble villages and scattered ranches, dwellings built of mud, of sod, or rough-hewn timber. The army fought for these people when occasion offered (and there was seldom a time when there was not fighting somewhere between the Canadian and Mexican borders), but it made life possible for the settlers in many other ways, and the lonesome post surgeons did their part manfully."

During the administration of the forceful and capable Thomas Lawson (1836-61) military rank was secured for medical officers in 1847, while in 1856 a great advantage was gained through the enlistment of hospital stewards as such. The next Surgeon General, William A. Hammond (1862-4), a man of open mind and big personality and one of the most eminent physiologists and neurologists of this country, started the Army Medical Museum (1862), urged the foundation of an Army Medical School (1862), fostered the administrative reforms of Letterman in the field, and created special military hospitals for the study of cardiac, pulmonary and nervous diseases, from which came the important work of J. M. Da Costa on irritable heart in soldiers (1862) and of Weir Mitchell, G. R. Morehouse and W. W. Keen on gunshot injuries of nerves (1864). Under Surgeon General Joseph K. Barnes (1864-82), the exclusive control of General Hospitals was vested in the Medical Department. Under General John Moore (1866-90) instruction in first aid was inaugurated (1886) and a Hospital Corps, enlisted solely for duty in the Medical Department, was authorized by Congressional Act of March 1, 1887. A new field equipment was acquired under Gen. Charles Sutherland (1890-93). General George M. Sternberg (1893-1902), Surgeon General during the Spanish-American War, and the pioneer bacteriologist of the country, founded the Army Medical School (1893), established bacteriological laboratories at the School and the posts, established a hospital for tuberculosis at Fort Bayard, and created the Army Nursing Corps (1901).

The Dodge Commission recommended *imprimis* a larger quota of commissioned medical officers. As this was dependent upon (highly improbable) increase in the Army itself, General O'Reilly created the Medical Reserve Corps (1908), an expedient probably suggested to him by the corps of medical cadets organized August 3, 1861 to meet the deficiency of medical officers in the Civil War, and in which he had served as a youth. The Medical Reserve Corps was made up of prominent physicians in civil life, who cooperated with the Medical Department in its endeavor to secure personnel of the best type. Meanwhile a year's supply of hospital furniture, equipment and medicines for an army four times the statutory strength was stored in the Medical Supply Depots, so that the Medical Corps was now in position to equip base hospitals and field units for war service more rapidly than their personnel could be brought together. Thus two seed plants for supplies and personnel—the prime desiderata of armies in wartime and the main recommendations of the Dodge Commission—had already been secured prior to our entry into the European War.

Of the achievement of medical officers of the Civil War period we may mention the pioneer work of J. J. Woodward in photomicrography, of Billings in public hygiene, hospital construction, vital statistics (U. S. Census) and medical bibliography (Index Catalogue), of Woodhull on the exhibition of ipecac in dysentery (1875-6), of Weir Mitchell on peripheral nerve lesions. American neurology came out of the Civil War, and in the work of Hammond, Mitchell and J. C. Dalton, may be said to have grown up in the Army.⁶⁰ Meanwhile the acquisition of new tropical possessions gave to the Medical Corps an opportunity eagerly grasped, and which came to prompt fruition in the shape of new discoveries in the field of tropical medicine. The great impetus given to bacteriological research by Sternberg led to the work of Reed, Carroll, Lazear and Agramonte on the transmission of yellow fever (1900) and the subsequent sanitation of Panama by Gorgas (1904-13) which made the Canal possible. During the typhoid epidemic in the Spanish-American War fly-transmission was demonstrated by Walter Reed, Victor C. Vaughan and Edward O. Shakespeare (1899). In 1899 Hoff vaccinated the Porto Rican population against small-pox and stamped out leprosy in the island. In 1909 F. F. Russell vaccinated the army against typhoid fever. The work of the Medical Corps in the Philippines is analogous to that of the Indian Medical Service in Hindustan.⁶¹ The Anglo-Indian medical officers did brilliant work in the investigation of tropical diseases (Lind, Murchison, Vandyke Carter, Leonard Rogers), of serpent venoms (Russell, Fayrer), of hypnotism (Esdaile), of heat-stroke, and in therapeutics (Waring), surgery (Freyer), ophthalmic surgery (Macnamara, Smith, Elliot) and the anthropology and natural resources of the whole Indian peninsula. In the science of communicable diseases the Medical Corps of the U. S. Army has to its credit the pioneer work of Ashford on hookworm infection and tropical sprue, of Craig on malarial fever and the parasitic infections, of Craig and Ashburn on filaria and dengue, of Vedder on the casuation of beri beri and the use of emetine in amoebic dysentery, of Chamberlain on hookworm infection and beri beri, and of Gentry and Ferenbaugh on Malta fever. On the didactic side such text books as those of Christie on X-ray diagnosis (1913), La Garde on gunshot wounds (1914), Munson (1911) and Havard (1909) on military hygiene, Straub (1910) and Ford (1918) on medico-military administration and Mason on hospital corps instruction (1912), are only a few indications of the spirit of professional and scientific preparedness which animated and informed the Medical Corps prior to its participation in the European War.

⁶⁰ W. Browning: *Sources of Intellectual Power*. Osler Anniv. Vol., N. Y., 1919, I, 881.

⁶¹ For an account of which see, F. H. Garrison: *Edinb., M. J.*, 1914, n. s., XII, 425-432.

CHAPTER IX

The European War

Henry James once defined aristocracy as "bad manners organized." Carlyle opined that democracy is "an institution that permits Judas Iscariot to slap Jesus Christ on the back." Between these two extremes lies somewhere the delectable *via media* of the Greeks, the *medium tenere tutissimum* of the Romans, the pathway followed by the world's gentlefolk in all periods of historic time. In the 19th century the great principle, "choose equality and flee greed," was lived up to by all serene people whose feeling for balance, poise, equity, proportion was such that they did not take themselves seriously, did not expect others to take them seriously, and thus maintained their own internal security with a noble simplicity toward their environment and their fellow creatures. Meanwhile, toward the end of the period, the industrial-democratic movement engendered by the Napoleonic wars reached its height. In the olden time the small producers, the artisans, tradespeople and mechanics, were those who fed, clothed, buried us and generally took care of us through life. Through the invention of vast numbers of mechanical and labor-saving devices these now gave way to a great manufacturing and commercial class, which was, in turn, devoured by the régime of capitalists, exploiters and promoters, with an industrial proletariat as its vassals. The effect was to produce a continuous *trek* of countrypeople to the cities with the usual consequences of new industrial diseases, bad sanitation, poverty, prostitution and high infantile mortality as Nature's set-off to overpopulation and overcrowding. Under the unnatural stress and competition of city life the struggle for existence obtained with full force, a phenomenon which received its true explanation, as biological doctrine, in the writings of Darwin. But what the quiet naturalist of Down had described as a working principle in the pitiless scheme of Nature, inimical to the higher development of man (since man carries, in the very structure of his body, the evidences of "his lowly origin"), became, in Schopenhauer's gloomy and powerful picture of human history, the "will to live" as the *impetum faciens* or driving force behind the uglier phenomena of man's existence. In the philosophy of Friedrich Nietzsche this became the "joyous affirmation of our being," and was exalted into an ethical principle in opposition to the Eastern doctrine of the renunciation of existence and the "slave-mortality" of Christianity. Nietzsche was a talented professor of philology who, as a youth, ran errands for

Richard Wagner and whose amatory propositions were repelled by the authoress, Lou Andreas-Salomé. His disinclination to continue as press-agent for Wagner, his disgust at the mawkish parade of Christian symbolism in *Parsifal* (an artistic blunder perpetrated by the composer to please his second wife) led to a break in these friendly relations, which proved a distinct tragedy in Nietzsche's life. He ended his days as a madman. A master of epigram, with an otherwise abominable literary style, his realistic philosophy is the most ferocious assault on the ethics of Christianity ever made. It voices, in brief, the doctrine of the super-man or "blond beast" as the natural lord of existence, the inevitable subjection of people with botched bodies and inferior minds as "slave races," the necessity for a thoroughgoing "transvaluation" of all current ethical values, and the old Greek idea of the eternal and cyclic recurrence of all worldly events (history repeats itself). Nietzsche's philosophy is thus a composite of elements variously discoverable in the writings of the pre-Platonic philosophers, Machiavelli, La Rochefoucauld, Chamfort, Stendhal, Emerson, Walt Whitman, Roosevelt and later moderns, and is now become a commonplace in the cheaper fiction of our current magazines. All that Nietzsche has to say of the morbid and mealier-mouthed elements in Christianity as a practical, working system of ethics is contained in the epigram of Heine: "Christianity, by inculcating hound-like humility, has proved, in the end, the surest support of despotism;" but with this inconsistency, that Nietzsche regarded despotism and the enslavement of inferior peoples as an excellent thing in itself. The Nietzsche philosophy, once a private luxury of antique despots and more recent artists and literary virtuosi, is thus in the nature of dangerous dynamite in a society based upon industrialism in which even rulers, soldiers, clergymen, physicians, artists and poets are virtually industrials. It is also inimical to the valid principle which emanated from the Cromwellian brow of Jeremy Bentham—"the greatest good of the greatest number"—upon which modern medicine, sanitation and social endeavor are based.

The small kingdom of Prussia, which after 1870 dominated modern Germany, was developed upon the Roman and mediæval theory of the State as an entity to which the rights of the individual must, on occasion, be sacrificed, and its growth in political and military power was attained, as with the Romans, by making war. Serfdom existed in Prussia until the early years of the 19th century. The dominating military caste or autocracy, endowed with the powerful physical habitus of a Northern race and with administrative abilities of a unique order (the results of long experience and training), constituted, in a local relation, the tribe

of supermen of Nietzsche's dreams. These Nordics were, many of them, not different from other Nordics in overweening selfishness, arrogant demeanor, hard conceit, mordant, metallic humors,¹ and the blundering mentality which impels the aboriginal male to take the bit in his teeth and drive his head against stone walls; others, of cleverer type, fenced themselves behind the artificial *politesse stérile et rampante* of the 18th century; others, endowed with clear, lucid minds, had the simplicity, courtesy, geniality and inevitable good taste which go with such minds.² The general run of the population, described by Maximilian Harden as "a crude but courageous people," were not without some of the virtues which Lord Byron satirically ascribes to "the nations of the moral North," and there were French and Jewish refugee elements that made for practical ability and a sense of real values.

Upon this people devolved the management of the great German Empire after 1870. The government was entirely in the hands of the privileged caste, with the Kaiser as supreme war-lord, and a highly organized bureaucratic machine which, not unlike that of mediaeval Byzantium, controlled the public affairs of the smallest and remotest hamlets. The success of this administrative machine in regulating commerce, customs duties, agriculture, finance, education and the sanitation of model cities was, for a long time, the admiration of the civilized world. The German organization of scientific investigation, their remarkable thoroughness in physics, chemistry, medicine and other branches of laboratory science, as also their skill in mechanical inventions and mechanisms of precision, made them the masters of reality; while, at the same time, the South German production of many charming things of human interest, from music "the best in the world" to children's toys and the Christmas tree, were so attractive that many cultivated people regarded Germany as their "intellectual home." Germany was regarded as the model state and, partly in consequence of this adulation, there grew up, following the accession of Wilhelm II,

¹ The offensive and somewhat meddlesome type of banter, which would elsewhere be resented as a gross personal liberty, was noted by John Jay and other American travellers in the early 19th century, and even in the private letters of the charming alto, Hermine Spiess. Theodor Fontane, the poet of Berlin and of the *Preussentum*, describes the typical Berlin *Hausvater* as ready to snap his wife's head off on the slightest provocation, no matter how amiable, reasonable, affectionate or submissive her disposition might be.

² Of all officers of the Prussian Army, there were none of finer mould than the late Surgeon General, Leut. Gen. Otto von Schjerning. He was genial, pleasant, courteous, affable, and as shown by his introduction to the German Medical History of the War, absolutely fair-minded and free from prejudice. He was, incidentally, one of the masters of Roentgenology, in which he could have made a great reputation but for his tendency to efface himself, using his high position to forward the science behind the scenes and encouraging others to "go up and occupy" as Sidney Herbert did in the case of treatise on hygiene.

the ancient Jewish cult of a "chosen people," the same cult which Matthew Arnold ridiculed in the Anglo-Saxons of the post-Napoleonic period. The short, successful campaigns of 1864-6 and 1870 engendered the belief that more could be accomplished in wars of conquest. For nearly half a century (1870-1914) preparations of the most intensive and extensive character were made, including wholesale manufacture of ordnance and munitions, training of the available male population for instant mobilization, an enlarged navy, the new devices of submarine and dirigible aircraft, an elaborated system of spies and foreign agents for propagandism, and the education of the people, from childhood up, in the hope and belief that German efficiency was predestined to dominate the world.

All this produced a narrowing, brutalizing effect upon the minds of the people, who, in earlier days, had been universally liked for a certain broad, genial, tolerant, good-humored and hospitable humanity. It began to be perceived by observant travelers that the multiform Germany of the past, the Germans of the older romantic dispensation, existed only in spots. Continental Europeans and expatriated Americans who were "in the know," realized that a great world war was inevitable, but the warnings of shrewd observers like Lord Roberts, Lauder Brunton, Chéradame, Emil Reich and others were either ridiculed or ignored. The pre-disposing and exciting causes of the pan-European war, some of them rooted in the remote past, are multiplex and defy analysis; but overwhelming evidence exists that it was deliberately planned and precipitated, and that, in the words of Norman Thomas, "it was not a spontaneous outburst of racial antagonism, but a clash of imperialist interests, primarily economical, brought about by financiers, diplomats and soldiers who, for shortsighted ends, played upon mob psychology." The tragedy at Sarajevo, followed by the Servian imbroglio, fired the train, and the Kaiser declared war on August 1, at 7.10 p.m. The effect was that of the thunderclap preceding a great storm of uncertain duration. In the lull which followed people had time to collect their thoughts a little. Just before the declaration of war Wilhelm Ostwald had denounced the hysterical "fear of Russia" apparent in Germany. Americans were puzzled that the Germans, then at the top-notch of their commercial prosperity, should, contrary to Bismarck's warning, challenge fate³ and imperil their future by

³ The Franco-Prussian War was precipitated by Bismarck, but in after years he was wise and temperate in his foreign policies, realizing that the next great European War would be a "*saignée à blanc*." In his later period, he declared that his governing principle was "*Unda fert, nec regitur*"—to be guided by the trend of events rather than to attempt to direct them. His seal-ring bore the Russian device "*Nichevo*," i.e., take things as they come.

“fighting for piffle.” The English remained, as usual, cool and collected, and Parliament went into the war, like the Elizabethan seafarers, with bursts of laughter. German newspapers requested that, for economy of administration, the Allies send in their declarations of war “by the dozen” (*dutzenderweise*). Meanwhile Lord Kitchener predicted that the war would last at least three years and stated the prophetic belief that few of those who began it would live to end it. Little realizing what was in store for them the German regiments in brand-new field-gray uniforms marched down to the Rhine, singing their patriotic songs, to meet a vigorous and valorous counter-check in Belgium, and eventually to settle down to the bloody stalemate of the Western Front. As the immense conflict wore on it began to shake the remote confines of America, Asia and Africa. The conviction penetrated the minds of most reasonable people that the precipitation of this war was a crime of *lèse-humanité*, or, in the words of Sudermann, “the most gigantic imbecility since the Crusades.” It meant the destruction of the 19th century civilization, the advent of a drier, more tedious, more metallic order of things in opposition to the broad, inclusive ways and designs of multiform universal nature. It was felt that the future of humanity, the hopes of centuries of patient endeavor, were at stake in this war; and it was upon this world-wide conviction that the Allied nations were eventually able to gather force to end it. The three wars which preceded the World War had considerable teaching value, but, except in military medicine, the lessons were not heeded.

The South African War (1899–1902) was, in respect of the curious Anglo-Saxon indifference to preparedness, not unlike the Crimean or Spanish-American wars. In the early stages the British suffered considerably (especially in officer personnel) from the pitiless marksmanship of the Boer riflemen who were natural skirmishers; it was not until Kitchener had concluded his enveloping operations that the contest was brought to successful termination. The only field medical units, Lynch points out, were the litter-bearer companies (organized 1879–80), the field hospitals (one for each brigade), with additional reserve hospitals for divisions and corps, but no clearing houses for the sorting and evacuation of the wounded to the rear. This led to the invention of the mobile casualty clearing station or evacuation hospital (1907), situated at railhead, for *triage*, housing and ultimate evacuation by improvised hospital trains. Difficulties with typhoid fever brought about the initial experiment in preventive vaccination of a command, which, while not entirely successful, established the practice in military procedure. The reorganization of the Royal Army Medical Corps following the war resulted in enlarged authority for British medical officers, better education and training at Netley, increases in medical personnel and supplies, the union of litter companies and field hospitals to form field ambulances (1905) and the foundation of the Journal of the Corps, devoted to military medicine.

The Russo-Japanese War (1904–5) found the Japanese army well organized along German lines, particularly their medical department, which employed Letterman's

system of evacuating the wounded, at the same time filling in the lacuna in Letterman's organization (which had no bridge between field hospitals and base) by means of "Reserve Medical Personnel," the equivalent of evacuation hospitals. The Russian service was poorly organized except on paper and, like the Austrian, was behind the times in the matter of assigning line officers to command medical units, although an order to the contrary effect had been issued too late to change anything in the field. The adequacy of the Japanese divisional and regimental medical service was demonstrated at Mukden where they evacuated their wounded with precision, while the Russians suffered terrible losses and elsewhere depleted their firing lines by detailing hundreds of enlisted men to escort the wounded to the rear. In the Japanese Army the Red Cross was subordinated to the Medical Department; in the Russian Army it was given an independent status, causing vast confusion. The Japanese first employed advanced methods of sanitation and front-line surgery (with high mortality of medical officers) as a means of saving and salvage of personnel, this new principle being writ large in their battle-orders ("The Russians have more men, but we can save more men"). The Japanese estimates for adequate medical personnel in field operations (10 per cent of command in wartime) led to the establishment of this ratio both in our tables of organization and in the European War; and the incorporation of evacuation hospitals in our medical administration (1910) was derived from this war which, with the two Balkan Wars of 1912, was effective in demonstrating the high efficiency of the new methods of field administration in stationary or trench-warfare under the stress of long-range guns and high-power explosives. Even our popular magazines made it plain to the public that the days of old-fashioned warfare in the open, with charges led by a general on horseback, were over.⁴

The European War began with the German blunder of the invasion of Belgium, which, through the heroic resistance of the Belgians at Liège and Namur, delayed the invasion of France by two weeks. The French blunder of a counter-invasion of Alsace-Lorraine, instead of squarely facing the enemy on the north, resulted in the disasters at Mons and Charleroi (August 21-23) and brought von Kluck's army within 25 miles of Paris. The battle of the Marne (September 6-10) saved the day for France. Then began the race for the Channel ports along the Yser line (September 20-October 20), in which the Germans captured Antwerp and Lille but were repulsed at Ypres (October 31) and so failed to reach Calais and Boulogne.

On the Eastern frontier the Russian invasion on the north was checked by the Germans at the battle of Tannenburg (August 26), but the Russian thrust through Galicia resulted in their capture of Lemberg (September 5), while the Serbs defeated the Austrians on the Jedar, drove them out of Galicia, and invaded Bosnia and Herzegovina. To save the situation the Germans were forced to withdraw troops from the Western Front and, invading Russian Poland, were defeated at Warsaw (October 20) but won out at Lodz. On February 12, 1915 Hindenberg overwhelmed and destroyed the Russians in the battle of Mazurian Lakes, but in Galicia the Russians captured the fortress of Przemyśl (March 22). The Russians were then overwhelmed by Mackensen and Hindenberg, their whole line from the Baltic to the Carpathians was thrown back with terrible losses

⁴ Through kind permission of Col. Chas. Lynch, M. C., these data have been derived from his valuable introduction to "The Medical Department of the U. S. Army in the European War," soon to be published.

(1,200,000 killed and wounded), and Warsaw fell on August 5. Turkey had joined the Central Powers on October 29, 1914, and Italy went over to the Allies on May 23, 1915. By this time the contest on the Western Front had resolved itself into "warfare of position" (trench warfare), with failure of the Allies to pierce the German lines through lack of adequate artillery and munitions. The British were practically defenseless in the costly episode at Neuve Chapelle (March 10), the French offensive in the Champagne came to nothing, and, through the use of gas, the Germans all but broke through to the English Channel in the second battle of Ypres. Frustrated on the sea in the naval actions of Heligoland and the Falkland Islands the Germans began to make war by means of submarines, bombing of unfortified towns by air-raids, the use of poisonous gases and "frightfulness." Although the London *Punch* had pronounced the Zeppelin "my best recruiter," Great Britain was forced to adopt compulsory military service on May 25, 1915. The sinking of the *Lusitania* on May 7, 1915 with loss of 1,198 lives (124 Americans) made it a foregone conclusion that the United States would eventually enter the war. Manufacture of munitions was forwarded on a grand scale, the Allies obtaining munitions and supplies from America, the Germans exhausting the supplies of the Scandinavian and other neutral countries. Serbia was overwhelmed by Mackensen in October-December, 1915.

On February 21, 1916 the Crown Prince began his offensive against Verdun, having occupied the St. Mihiel salient since 1914. Douaumont was captured, but at Vaux and Le Mort Homme (March 8-16) Petain held his 30-mile line against the Germans, and, in spite of the pronounced German advance in May and June, his famous dictum, "*Ils ne passeront pas*," held good. The losses on both sides were about 500,000. The Allied offensive on the Somme (July-November) relieved the pressure at this stage. The British introduced tanks and the Germans pill-boxes of masonry behind their third-line trenches, while dug-outs, concrete chambers, camouflage, automatic rifles, hand grenades and antique helmets were in use on both sides. In the summer the Russians were victorious against the Turks in Armenia and reinvaded Galicia, overwhelming Bukovina after their victory at Lutsh (June 6). Under false promises from the disloyal Petrograd régime the Rumanians entered the war on the Allied side in July, but were overwhelmed by the Austrians, Germans and Bulgarians under Mackensen, and Bucharest fell on December 6. The British offensive in Mesopotamia had proved a total failure, particularly in medical organization, and terminated with General Townshend's surrender to the Turks (April 29). The naval battle off Jutland (May 31, 1916) terminated in a draw, but the Germans confined themselves to submarine activities thereafter.

The signal events of the year 1917 were the Russian revolution resulting in the deposition of the Czar (March 15), and the entry of the United States into the War (April 6). Russia, undermined by German agencies in the central administration, from the Czarina down, dropped out of the war and was given over to anarchy and Bolshevism. The year 1917 was the darkest of the war and little could be accomplished before the summer. In March, following the Allied advance between Arras and Soissons, the Germans withdrew to the Hindenberg line, 60 miles long, in consequence of which the British attack on Arras resulted in only slight gains. In midsummer (July-September) a new Allied offensive was begun in Flanders with the object of destroying the submarine bases at Zeebrugge and Ostend, but this also resulted in comparative failure. Submarine warfare was now unrestricted and vessels "*spurlos versenkt*." The successful Italian offensive on the Isonzo front (May-September) was counterchecked by an unexpected Austro-Hungarian drive into Northern Italy in November, resulting in the disaster of Caporetto and the Italian retreat to the Piave River 15 miles from Venice, checked only by French and British reinforcements. The British failure in Mesopotamia was retrieved, however, by General Allenby's invasion of Palestine from Egypt, resulting in the capture

of Bagdad (March 11) and Jerusalem (December 9), a triumph of tactical maneuvering. A new British offensive at Cambrai (November 22–December 31) was partly successful through the employment of tanks. The United States declared war on Austria on December 7. In the treaty of Brest-Litovsk the Russian Bolsheviki made peace with the Germans, thus enabling the latter to concentrate all their forces on the Western Front.

Early in 1918 the Germans began to prepare for a great final offensive, and the Allies coördinated and unified their efforts under the supreme command of General Foch (March 28). On March 21 Ludendorff began his drive on the Somme with an army of 1,800,000, eventually covering a front of 100 miles, and on several occasions almost succeeded in breaking through the lines by ruthless sacrifice of dense formations hurled forward in successive waves. Although the whole Somme area was reconquered, the offensive around Chemin Des Dames was blocked by Foch's superior strategy, but a third drive (May 27), deploying 400,000 men, reached the Marne (40 miles from Paris) and extended to Château-Thierry. A fourth offensive in the Rheims sector (July 15) was balked, and immediately thereafter the general Allied offensive was launched by Foch on July 18. In this American troops, who had taken part in different sectors since November, 1917, distinguished themselves signally in blocking the German advance at Château-Thierry (July 18), in reduction of the St. Mihiel salient (September 12) and in the subsequent offensive in the Meuse-Argonne region. The Allied advance was along the whole line from the Channel to Verdun, the Germans retreating through Northern France and Belgium with rear-guard action. The signing of the Armistice on November 11, 1918 enabled the enemy to retire without further damage to themselves.

In the matter of medical administration for the war the French, like the Germans, mobilized all their physicians for the service of the country, those too old for field duty continuing at their posts as practitioners and teachers, at the same time managing, on occasions, difficult cases from the front at their special clinics. In this way much valuable original work was incidentally done in neurology, oto-rhino-laryngology, orthopedics and the other specialties. The device was possible in France, Germany, and eventually England because, in these countries, clustered as they were about the theatre of war, the distance between front line and base was not great. Some elderly practitioners even rendered valuable military service in mufti. Blanchard, the eminent parasitologist, originated the idea of evacuation of the wounded by aëroplane. Tuffier, in some respects the most influential medical personality in France, managed the administration of front-line surgery for the entire army in civilian attire, his directions about procedure and technique being transmitted by telephone along the whole line, where necessary. England, facing the necessity of raising a corps of 12,000 medical officers as speedily as possible, had to acquire no less than 11,000 of these from the civilian profession, and it was her application for 3,000 additional medical officers from America that speeded up the mobilization of our own Medical Reserve Corps. The Italians who entered the war late, with ample time for preparation, profited by the experience already gained by the French and English (as we did) and thus acquired

an excellent medical organization. The medical department of the German Army was fully prepared as to personnel, supplies and rolling stock, and had even blocked out methods for the reconstruction and reëducation of the wounded and disabled ten years before the war.

During the war period our own army, with an authorized strength of 230,656 (Act of June 3, 1916) expanded from a nucleus of 217,272 officers and men (January, 1917) to a force of 1,452,516 officers and men in one year's time, and, at the date of the armistice, comprised 3,567,856 officers and men, or nearly twelve-fold expansion; while the Medical Corps which, on June 30, 1916 consisted of 443 medical officers, 146 medical reserve officers on active duty and 4,670 enlisted men, had expanded by November 30, 1918, to an organization of 30,591 medical officers (989 regulars, 29,602 temporary) and 264,181 enlisted men, a total of 294,772 on active duty. At the end of the war the Medical Corps was thus one and one-third times the size of the whole Regular Army of January, 1917. Two new organizations, a commissioned Sanitary Corps and a commissioned Ambulance Service were created, and, as shown in the Surgeon General's Reports, the commissioned Dental Corps was expanded from 86 to 4,620, the commissioned Veterinary Corps from 62 to 2,002, the contract surgeons from 181 to 939, the Army Nurse Corps from 403 to 21,480, and the civilian personnel from 450 to 695. The Surgeon General's Office was expanded from a personnel of 7 medical officers and 148 civilian employees (April 6, 1917) to an organization of 32 administrative units, with a personnel of 262 medical officers and 1,617 civilians (November, 1918). For the Medical Department Congress had appropriated by November 4, 1918 a sum of \$471,188,948, of which \$314,544,000 was spent, or only 2.2 per cent of the total war expenditure, estimated at \$14,244,061,000. This expenditure was wisely, liberally and carefully administered by the Division of Finance and Supplies of the Surgeon General's Office, which did signal service in creating new supply depots in our larger cities, getting in immediate touch with the leading manufacturers and merchants of the country, fostering the manufacture of drugs, instruments, bandaging material, and patented preparations which could no longer be obtained from Europe, and giving all necessary aid to the prompt shipment of these articles to the Western front.

A remarkable feature of the World War was the exploitation of all branches of science, from mathematical physics to psychology, from anthropology to entomology, and the utilization of the aid of scientific men on a scale never dreamed of before. In Germany this had gone on for years as part of the definite scheme of preparation for war of conquest, and the spectacted physicist and chemist in the dim background behind the General Staff became, in reality, a more formidable personage than the bomb-thrower or the infantryman in act to charge the trenches. During the war-period the chemist Emil Fischer occupied himself with such various problems as explosives, the invention of substitutes for animal fats, experimentation with synthetic foods and artificial means of obtaining nitrogen. In England physiologists like Starling and Leonard Hill rendered valuable service in the problems of war-gassing and asphyxiation, while Henry Head gained new insight into the physiology of the nervous system from the phenomena engendered by battle-wounds; Mott studied shell-shock and Lewis the neuro-cardiac syndrome

adumbrated by Da Costa. In France Marie and his fellow-neurologists enlarged the science of peripheral nerve lesions and of hitherto unstudied syndromes engendered by gunshot wounds of remote parts of the central nervous system; Carrel applied to wound-treatment the solution of a gas in a liquid devised by the English chemist Dakin, and the experts in reconstruction invented novel mechanical substitutes for the human hand to enable the mutilated soldier to gain a livelihood in various avocations. In our own army the psychologist determined the mental age of the enlisted man, the anthropologist measured him, the psychiatrist gave further aid in passing upon his mental condition, the metabolist and food chemist passed upon his ration, the physiologist and otologist determined the service requirements of the aviator, the physiologist and pathologist studied the effects of war-gasses, and the eye and ear specialists forwarded the reëducation of the war-blind and war-deaf. In the first year of the war the most eminent medical men of the country flocked to the colors and their services materially enlarged the scope of military medicine. Had it not been for the submarine difficulty, it would have been obviously simpler and more practicable to transport the major part of our drafted forces directly to France for training adapted to conditions in the war zone. But even before the arrival of the Chief Surgeon in France six fully equipped base hospital units managed to get across (May 8-25, 1917), viz., those from Cleveland, Boston, New York, Philadelphia, St. Louis and Chicago, which were distributed among the British Expeditionary Forces. In all 50 base hospital units were overseas by June 18, 1918. On September 4, 1917, through the bombing of the hospital group at Dannes Camiers by a German aeroplane, Lieut. William T. Fitzsimons and others were killed. The first American to render the supreme sacrifice was a medical officer.

Shortly after the arrival of General Pershing and his staff in Paris on June 13, 1917 Colonel Bradley (Chief Surgeon, A. E. F.) and his assistants set about the problem of acquiring hospitals for the base ports and lines of communication. The American line of troops being on the extreme right of the western front in the vicinity of Belfort, the locus of hospital sites was a line passing through the four base ports (Bordeaux, La Rochelle, St. Nazaire, Brest), the training areas (Gondrecourt, Neufchateau, Mirecourt, Valdahon) and along the two lines of communication, viz.: (1) St. Nazaire, Nantes, Angers, Tours, Romorantin, Gièvres, Nevers; and (2) Bordeaux, Périgueux, Limoges, Chateauroux. As our troops poured into France and casualties began to come in from the battle-lines, the original estimates for hospital beds was advanced from 73,000 beds to 600,000. On May 15, 1918, thirteen days before our First Division got into action (capture of Cantigny), there were already 30,187 beds available. On Armistice Day there were 261,403 beds available in France, with 193,448 patients in hospital (99,405 sick, 99,043 wounded), and in the home territory, 121,883 beds, with 69,926 patients, or a total of 353,887 beds in France and the United States, over twice the number available for the Union forces

in the Civil War (118,057 beds). The larger hospital centers in France (Allerey, Bazoilles, Toul, Mesves, Mars, Savenay) were originally 1,000 bed units with a crisis expansion, but some of these became in time great communities of as many as 30 base hospitals with an emergency bed capacity of 10,000-40,000 beds. The Mesves Hospital Center had in November-December, 1918 25,000 beds, with 20,186 patients (November 11), the total personnel and patients (28,828) outnumbering a division of infantry. Evacuation of the wounded from front to base, and eventually to the home territory, proved a large contract for the Service of Supplies, on account of the initial difficulties in obtaining hospital trains and other rolling stock, the frequently impassable conditions on the roads leading to the battle front, the stalling of vehicles and other disagreements common to war-zone operations. By November 11, 1918 129,997 patients (50,580 sick, 79,517 wounded) had been evacuated in 21 hospital trains of 16 coaches each, while 197,708 primary evacuations had been made in 50 trains lent by the French. Some 6,875 ambulances were sent to France and Italy and about 50 barges were in use on French waterways. By November 11, 1918 86,642 patients had been evacuated by ship from the base hospital ports to the United States.

The Chief Surgeon's office at Tours was organized in five administrative divisions, controlling the services of hospitalization, evacuation and hospital administration, sanitation, sanitary inspection and medical statistics, personnel, medical supplies, finance and accounting. The Service of Sanitation of the A. E. F. covered the organization of stationary and mobile laboratories, controlled by a Central Laboratory at Dijon, the sanitation and sanitary inspection of training and hospital areas, camps, base and their local hospitals, combat areas (trench hygiene) and moving armies, the preparation of the sick and wounded reports, and the analysis and study of communicable diseases in the Office of Epidemiology. The Central Laboratory provided for the prevention of threatened epidemics, allotment of standard supplies, training and research work. By coöperation with the Chief Engineer's Office a supply of pure water was insured, while routine examination of water supplies was managed by the Central Laboratory. Through the experts sent over by the Food Division, S. G. O., a modified ration was established by G. O. 176, G. H. Q. (October 11, 1918). At the Army Sanitation School at Langres lectures and training were given by experts in all branches of military medicine. These were of eminently practical tendency, based upon actual experience in the war-zone, and included the training of dental officers in field duty, extended in this case to administration of anæsthetics, first aid and general minor surgery.

In the Surgeon General's Office at Washington the Personnel Division built up the expanded Medical Reserve Corps and other branches of the medical service; the Division of Sanitation looked after the sanitary inspection of all army stations in the country, particularly the 32 training camps (some of the communities of 40,000-50,000 people), and, at the same time, managed the inspection of food, the prevention of communicable diseases, epidemiology, the developmental battalions and the preparation of medical records and statistics; the Hospital Division supervised the construction and management of camp, general and other hospitals; the Laboratory service was in charge of a special division, which also controlled communicable and venereal diseases; the Divisions of Medicine and of Surgery selected professional personnel and equipment for the hospitals and other stations; while neurology, psychiatry, psychology, dentistry, veterinary medicine, anthropology, gas defense, aviation service and physical reconstruction were each of them separately administered. The Medical Training Camps at Fort Oglethorpe and elsewhere gave intensive military, professional and special training to Medical Reserve Officers, while those admitted by examination to the Regular Corps received training at the Army Medical School. At the Medical Training Camps certain defects in American medical

education at various schools revealed themselves. In prosecuting the medical history of the War every encouragement was given to medical officers to publish the results of the findings in hospital or laboratory where time and opportunity afforded, and a number of magazines and practical handbooks were printed. In 1916 *THE MILITARY SURGEON* was improved in format and typography and became the principal repository for articles of this kind. Much valuable assistance was rendered to the Medical Department by the American Medical Association, the Council of National Defence, the National Research Council, the American Red Cross, the Rockefeller Institute, the Carnegie Institution of Washington, the U. S. Public Health Service, and other governmental departments and extra-military organizations. During the war period the medical administration of the British army was conducted by Gen. Sir Alfred Keogh and his successor Gen. Sir John Goodwin, that of the French by MM. Justin Godart, Simonin and Tuffier, that of the American by Gen. William C. Gorgas, that of the German by Lieut. Gen. Otto von Schjerning. The Chief Surgeons of the American Expeditionary Forces were Col. (Brig. Gen. N. A.) A. E. Bradley, Gen. Merritte W. Ireland, and (after October 4, 1918) Gen. Walter D. McCaw.

Statistic and Battle Losses

It is roughly estimated that nearly 60,000,000 men were mobilized by the 16 nations engaged in the World War, and that of these about one-third died or were killed, of whom over 7,000,000 were soldiers and sailors. The number of civilians who died from direct or indirect causes was tremendous. The following table gives an empirical estimate of the military losses compiled from various sources:⁵

Nation	Mobilized	Killed and died from wounds or disease	Wounded	Missing or prisoners	Total
British Empire.....	8,654,467	929,812	2,097,994	32,391	3,063,664
France.....	8,407,000	1,109,000	3,025,613	252,900	4,387,513
Russia.....	12,000,000	1,700,000	4,950,000	2,500,000	9,150,000
United States.....	4,175,367	112,855	224,089	14,363	351,207
Italy.....	5,500,000	460,000	947,000	1,393,000	2,800,000
Belgium.....	267,000	104,779	77,422	10,000	192,201
Roumania.....	750,000	200,000	120,000	80,000	400,000
Serbia.....	707,343	322,000	28,000	100,000	450,000
Montenegro.....	50,000	3,000	10,000	7,000	20,000
Greece.....	230,000	15,000	40,000	45,000	100,000
Portugal.....	100,000	4,000	15,000	200	19,200
Japan.....	850,000	300	907	3	1,210
Germany.....	11,000,000	1,686,061	4,211,469	991,341	6,888,871
Austro-Hungary.....	6,500,000	800,000	3,200,000	1,211,000	5,211,000
Bulgaria.....	400,000	101,224	152,399	10,825	264,448
Turkey.....	1,600,000	300,000	570,000	130,000	1,000,000
Total:					
Allied Powers.....	41,640,177	4,960,746	11,535,718	4,434,857	20,934,995
Central Powers.....	19,500,000	2,887,285	8,133,868	2,343,166	13,364,319
Grand Total.....	61,140,177	7,848,031	19,669,586	6,778,023	34,299,314

⁵ General Goodwin's estimate of British losses, furnished to the Surgeon General on January 12, 1921, was 474,254 killed in action, 139,664 died from wounds, 69,912 died from other causes, 1,668,573 wounded, 143 missing; total: 2,352,546. The French data, as above given, were furnished to the Surgeon General by Brig. Gen. L. Collardet, Military Attache of the French embassy on April 22, 1921. The Belgian data were furnished by Regimental Surgeon Voncken, editor of the *Archives Medicales Belges*, about the same time.

In the British Army, exclusive of Indian and African troops, the total losses were 569,143 killed in action, 170,509 died of wounds, out of 1,025,800 wounded, 83,975 died from other causes, and 143 missing. The Germans had 1,531,048 killed in battle and 155,013 died of disease out of 19,461,265 admitted to hospital (total mortality: 1,686,061). Their total mortality from wounds has not yet been computed. Their total losses were nearly 7,000,000; those of Russia even larger. Of our own wartime army, estimated at between 3,567,856 and 4,123,345 officers and men, 2,039,329 reported in France, and of these about 28 divisions (784,000 men) got into action. The total mortality on the Western front was 75,658, viz., 34,249 killed in action, 13,691 died of wounds, 23,937 died of disease, and 3,681 from homicide, suicide, drowning and other accidents. The total mortality of the U. S. Army from April 6, 1917 to December, 1919 was 112,855, including 54,105 from battle casualties and accidents and 58,075 from disease. Thus the mortality from battle casualties on the Western front up to the Armistice was over twice that from disease, while in 1917-19, the disease mortality was 10,076 higher than that from wounds, due to the devastating effects of the Spanish influenza epidemic in the training camps of the home territory. The casualties among our medical officers in France number 442, including 46 killed in action, 212 wounded, 22 died of wounds, 101 died of disease, 9 died from accidents, 4 lost at sea and 7 missing in action, showing that over one-half (258) were killed or injured from exposure to enemy fire and nearly one-fourth died from exposure to infection in hospital or otherwise. General Goodwin estimates the battle casualties among regular and territorial medical officers of the British Army as 23,504, viz., 3,181 killed in action, 1,429 died from wounds, 1,887 died from disease and other causes and 17,007 wounded, an impressive showing. The effect of the vast improvement in wound-treatment by modern methods is indicated by the fact that in the Civil War 31,978 died from wounds in hospital (10.48 per 1,000), in the World War 13,691 (4.5 per 1,000). The highest incidence of war-wounds in hospital occurred during the Argonne-Meuse campaign, viz., 38.37 per cent of admissions to hospital, with 41.52 per cent of deaths from such wounds. Comparative estimates in the Surgeon General's Reports and the statistical data in the Medical History of the War indicate that nearly twice as many were killed outright by shell-wounds as were admitted to hospital for such wounds, while the ratio of wound-incidence to deaths in the case of shrapnel was 15.08 per cent : 14.50 per cent. On the other hand the wounded from aeroplane accidents, aerial bombing, shell and shrapnel wounds had a higher case-mortality in hospital than rifle or pistol wounds, while recovery was the rule in the case of gassing. The experience of the Western front is to the effect that gassing is not nearly as destructive as gunshot injuries. While wounds of the chest and the extremities were most frequent, there were fewer chest and arm wounds than in the Civil War, and more of the head and lower extremities. More than twice as many men were killed from head wounds as were admitted to hospital, and nearly seven times as many from wounds of the abdomen, spine and pelvis. The number of killed and of wounded from injuries of the lower extremities was about equal.

Military Surgery in the World War

Dr. W. W. Keen has drawn a vivid contrast between the surgery of the Civil War and that of the World War.⁶ In the Civil War chloroform and ether were employed, but the hypodermic syringe, clinical thermometer, retractors and hæmostatic forceps, sterilized gauze, rubber gloves, motor ambulances and mobile laboratories, first-aid packets, trained nurses, X-rays, antiseptics, iodine solutions, and preventive vaccination were unknown; and field surgery was eked out by the use of germ-laden sponges, bullet-probes and silk-ligatures, wounds being explored or widened by surgically unclean fingers, wound-infec-

⁶ W. W. Keen: New York Med. Journal, 1915, ci, 317-324.

tion, septicæmia, pyæmia, erysipelas, hospital gangrene and tetanus were common, and suppuration the rule. Even S. D. Gross sometimes sharpened his knife on his boot and threaded suture-needles by wetting the silk with saliva. In the World War the leaden Minié ball, with its tendency to lodgment and deformation, was replaced by the jacketed bullet of high velocity, effectiverange and penetrating power at long range, but pulverizing hard bone at close range, as was common in the shortly separated trenches of France and Belgium. Even more frequent and more destructive were the effects of explosive shells, shrapnel, hand-grenades and bombs which had been familiar to military observers in the Russo-Japanese War; while aëroplane bombing, dropping of high-power explosives from Zeppelins, gassing, and the use of *Flammenwerfer*, "whiz-bangs" and other ancient or modern devices added to the general havoc and increased the surgeon's responsibilities. The first fact borne in upon the surgeons of the Western front was La Garde's principle that there is no such thing as a sterile gunshot wound. The soil of France and Belgium, cultivated, manured and defiled by the excreta of animals for centuries, was found to be so laden with *B. welchii* and other pathogenic germs that Dr. Sidney Rowland was able to inoculate a guinea-pig with gas-gangrene from a few drops of its muddy water, the animal dying in eighteen hours. Long periods of duty in the muddy and sometimes filthy trenches, furthermore, made the soldier's skin, as well as his uniform, dirty and germ-laden, so that bits of the latter driven into the wound almost inevitably produced infection. Again, the rotary motion of the modern jacketed bullet, which leaves the rifled muzzle of the weapon making 2,500 revolutions on its long axis, reduces the soft tissues penetrated by it to a devitalized pulp which undergoes necrosis and is otherwise an ideal medium for growth of pathogenic bacteria. Surgical asepsis, under such conditions, was impossible; it became necessary to go back to the fundamental Listerism or antisepsis. It was soon found, however, that strong antiseptics, applied to deep infected wounds, would not sterilize them. There followed a long series of "trial and error" experiments with such milder preparations as the synthetic dyes of the triphenylmethane series (crystal violet, malachite green, brilliant green), trypanflavine (acridine series), the mixture of bismuth subnitrate, iodoform and paraffin known as "bip" (Rutherford Brown), or the hypertonic salt solutions recommended by Sir Almroth Wright to facilitate wound repair by increasing the flow of lymph from the wound-surfaces. Through the necessity of applying these mild antiseptics continuously to the surface of such wounds, practice settled down to the use of the neutral sodium hypochlorite solution devised by the English chemist, H. D. Dakin, which was devoid of the irritating free alkali in the commercial hyperchlorites commonly employed in the sterilization of water. Continuous irrigation of the wound was secured by Carrel's device of inserting a series of rubber supply tubes, arranged like an inverted Jewish candlestick and fed by a common tube from the receiver. This liquid, along with Lorrain Smith's neutral mixture of calcium hyperchlorite and boric acid (eusol), depended for its action upon the disinfecting property of the free chlorine held in solution, which was also true of dichloramine-T, subsequently introduced as a spray for wound-infection, throat-infection or sterilization of meningococcus carriers by Dakin. The principle was copied by the Germans who, at the same time, introduced such preparations as vuzin or eueupine, depending for their action upon the release of free formaldehyde as in the case of formamint and other preparations devised by them for the treatment of infections of the throat, conjunctiva, genital tract, etc. In spite of the success of these devices in the stationary hospitals, continuous application of the Carrel-Dakin solution was practically impossible during the long transit of the patient from evacuation hospital to base, which sometimes occupied twelve hours or more. The forgotten principle of *débridement*, or excision of the devitalized, necrosed portions of the wound with primary suture, was revived by Lemaître and H. M. W. Gray, and in this

way the danger of infection between front and base was effectually bridged over, and thousands of lives were saved. When our forces arrived in France, wound-excision was still in the trial stage, but it soon became firmly established as a true aseptic principle in front-line surgery. The comparative percentages of case-mortality of wounds in the Civil War and the World War, as given in the Surgeon General's Reports, show the great advances made in wound treatment on the Western front. The case-mortality in wounds of the head and the extremities in the World War was reduced by nearly one-half, with material reduction in wounds of the chest, neck and genitals; while wounds of the back and abdomen showed a higher case-mortality in the World War due to the destructive character of the newer artillery projectiles and explosive shells. Wounds of the abdominal and pelvic viscera were relatively hopeless in both wars for this reason, but the case mortality in gunshot fractures of the long bones and joints was reduced in astonishing measure. The successful transportation of such fractures over long distances was greatly facilitated by the revival of the Thomas splint and the subsequent use of the Balkan frame. New light was thrown upon the pathology, prevention and treatment of traumatic shock through the investigations of Porter, Crile and Cannon. Roentgenography was freely employed in the location of bullets, and through many new inventions and the splendid equipment of the American teams great advances on the technical side were made. Anaesthesia under the new conditions was carefully studied and became a fine art in the great war. Brilliant work was done in abdominal, reconstructive (orthopedic), maxillo-facial and neurological surgery; and the surgery of the chest was forwarded by experimental laboratory investigation. In this history the names of Tuffier, Morestin, Lemaître, Willems, Depage, Moynihan, Makins, Gillies, Jones, Cushing, Crile, Blake, Bastianelli and Vanghetti will be memorable. In surgical administration the English Casualty Clearing Station or railhead hospital, introduced into our Tables of Organization as the Evacuation Hospital, had existed only on paper prior to the World War. It proved to be most effective as a clearing-house for reception and classification of the wounded with reference to stationary treatment or immediate transportation to base. As the war approached its end and the Allies were able to make advances in the open, the evacuation hospitals were pushed closer up to the front-lines, and eventually centres of *triage* for sorting out the wounded were improvised. This device was further helped out by another invention of the Western front, the *barrage* or curtain of fire, behind which the litter-bearers were able to collect the wounded by daylight instead of after dark, with wonderful improvements in the mechanism and speeding up of prearranged evacuation during offensive movements forward.

Military Sanitation in the World War

The success of the Japanese in applying the modern devices of sanitation to the salvage of personnel in the Russo-Japanese War made it self-evident that, in a contest involving armies of millions, neglect of these principles would spell disaster worse than defeat for the unwary. As a matter of fact the episode of the Western front turned out to be the greatest triumph ever achieved by military sanitation, as shown by comparison with the ravages of typhus fever on the Eastern front, or the effects of the Spanish influenza epidemic of 1918-19, which was relatively more destructive to life than the war itself. With the influenza epidemic the medical profession was dealing with a phenomenon of almost unknown causation, as had been the Japanese military experience

with beri beri in 1904-5. The medical officers on the western front found themselves confronted first of all with the problems of trench warfare and the diseases consequent upon prolonged exposure to cold, dampness, contaminated soil, filth, lack of bathing facilities and the ever-present possibility of vermin infestation. The Germans, fighting behind a cordon of heavy artillery, in which the Allies were at first deficient, were able to entrench themselves securely behind their third lines in subterranean passage-ways and chambers of solid masonry which could easily be kept clean; but every soldier who fought in the front-line trenches was predestined to become dirty and also lousy. Delousing, therefore, came to be an elaborated procedure, a little science in itself, with special stations for bathing and steam disinfection, and by this means typhus, and eventually trench fever, were abolished from the war-zone in the West. The location of the louse as the vector of trench-fever by English investigators and the conclusive demonstration of this fact by the American Commission was one of the original contributions of the war period. In like manner smallpox, the typhoidal infections, traumatic tetanus, diphtheria and even the dysenteries were rendered comparatively innocuous through preventive vaccination. The meningitis rate was lowered by vaccination and control of carriers; malarial fever and tuberculosis were kept in hand; and even the rheumatic and gouty disorders were controlled far better than formerly. In the Southern camps in the United States yellow fever, which might have been a formidable scourge, was non-existent; but in the early stages of the training of drafted men the infantile diseases, measles, mumps, meningitis, scarlatina, exacted a heavy toll among raw recruits. This was partly owing to the fact that such recruits were often country-bred, from sparsely settled districts, and therefore non-immune to diseases to which the city men had been exposed from infancy, but also because most of these diseases are sputum-borne and can thus be transmitted by the hand. The sputum-borne infections, particularly the pneumonias, remained the insoluble problem of the war. This was less apparent before the onset of Spanish influenza with its high mortality and its facile transmission by hand and mouth infection in the overcrowded cities; but even before this period it had become necessary to limit the transmission of sputum-borne diseases by segregating contacts and suspects, by swabbing the throats of carriers, by making provisions for increased air-space in barracks (the statutory number of occupants being stencilled on the doors), by employing Grancher's device of making each bed-space in the wards a virtual cubicle, by supervising the cleaning of mess-kits, and by teaching the actual or suspected carrier that his mouth and hands are a menace to society.

The highest incidence-rates of communicable diseases in our forces were those from influenza (729,381 or 228.14 per 1,000), gonorrhœa (220,348 or 68.92 per 1,000), bronchitis (208,592, or 65.24 per 1,000), mumps (195,490 or 21.13 per 1,000), syphilis (54,514 or 17.05 per 1,000), gout and rheumatism (49,505 or 15.48 per 1,000) and tuberculosis (31,106 or 9.73 per 1,000); the highest mortality rates were those from influenza (7.2 per 100) and pneumonia (5.23), the latter being due to the extraordinary malignancy of the pneumonias complicating measles and influenza. The epidemic of Spanish influenza caused 17.33 per cent of total admissions and 8.2 per cent of deaths in the Army. The total number of cases of sickness reported to hospital during 1917-18 was 2,422,362; the total number of deaths from disease 50,174 (16.67 per 1,000); with the Civil War rates we should have had 9,759,847 admissions and 227,094 deaths; with the Spanish-American War rate, 6,385,683 admissions and 112,656 deaths. In both wars there were 200 times as many admissions for typhoidal infections as in the World War and 100 times as many admissions for malarial fever. These and other data, furnished in the Surgeon General's Reports, show the extraordinary advances made by preventive medicine in the 20th century.

Control of Venereal Diseases

When our forces arrived in France it was soon perceived by those in command that a high rate of venereal infection would prove a serious handicap to the matter of getting troops into action, not only on account of the effect of such diseases upon the body, mind and morale of the soldier, but also because the number of days lost from duty and the need for segregation from comrades was as great as in the other communicable diseases of grave type. In 1917-18 the Allies' prospects were dark, the forces at the front were well-nigh exhausted from constant fighting, and there was a crying need for fresh personnel. At the base ports of debarkation, therefore, every effort was made to keep the men away from prostitutes and *vice versa*, and although it took some time to convince the port authorities that these efforts were not so much of a religious or ethical order as based upon a definite practical aim, to help them win victories, some *modus vivendi* was at length effected, and a sanitary cordon was established about the ports. When the troops went up to the training areas the problem became more complex, and this was also true of the training camps in the United States.

In the section for Combating Venereal Diseases of the Laboratory Division, S.G.O., an elaborate program was blocked out and carried into action, comprising (1) the use of prophylactic measures where necessary; (2) coöperation with the Public Health Service in the control of extra-cantonment areas; (3) education of the soldier in regard to the meaning and purpose of his sexual nature, the consequences of venereal infection and its effect upon his descendants and the fact that continence is nowise injurious to health but possible to every well-balanced individual; (4) appeal to his better nature by means of pamphlets, lectures, personal talks, moving-picture scenarios, etc. In spite of these efforts the incidence-rate of gonorrhœa during 1917-18, as seen from the above figures, came second, and that of syphilis seventh in order of magnitude among the communicable diseases affecting our troops. Of 259,621 cases of venereal diseases reported in 1917-18, in an army of 3,361,848, about 196,000, or nearly two-thirds, were brought into the army

from civil life, the remaining 62,612 being cases contracted after enlistment or which had escaped detection before enlistment. The venereal admission rate among negro troops was seven times that of the white, and among Southern troops, who showed a higher venereal rate than in troops from other parts of the country, the negro rate was four times that of the white. Ashburn's analysis of venereal statistics in the Army during 1918⁷ shows 133,203 cases introduced from civil life out of 196,008. The incidence-rate of cases contracted after enlistment (62,805) was 45.46 per 1,000, and of these 5,024 were negro, 57,781 white. There were, therefore, 65,242 venereal cases brought in from civil life by 2,023,945 whites (3.22 per cent) and 67,961 cases brought in by 325,548 negroes (20.87 per cent) at the ports of embarkation. Such infected troops were segregated and not permitted to go overseas, yet the infection rates at home and abroad were about equal. During the five years 1912-16, however, the rates of venereal infection in troops stationed in the United States were 93 per 1,000 for whites and 105 for negroes. The rate of venereal infection of drafted men in 1918 (56.69 per 1,000) thus lowers the earlier rate by one-half. The high venereal rate among men from the civil population is to be attributed in part to the increase in sexual promiscuity and laxity of morals in our overcrowded cities under war-time conditions, and to the fact that immunity from venereal infection, even after exhibition of the newer parasitocidal remedies, is illusory. Among all strong peoples of the past *potentia generandi* was exalted above *potentia coeundi*, as shown by the deification of the generative powers in nature even by savage races. The swaggering bravos in the Elizabethan plays did not boast of their amours but of the number of lusty children they were capable of begetting. The Greek gods in Hesiod and Homer were of the same mind. The artificial sterilization of marriage by chemical and other contraceptive measures has, as Bernard Shaw affirms, effected a complete revolution of opinion, as shown by the literature, art and some of the social customs of the present hour. It is no exaggeration to state that our period is saturated with sexuality. The "furtive, retiring sensuality" which Lecky attributes to the northern races has given place to a spirit as cynical and forward as that of the Latins in whom no Freudian complexes exist. The American is perhaps saved, in some measure, by his irrepressible sense of the comic. The appeal to the enlisted man is simple: You are a responsible member of society. If you become infected with venereal disease, you may ruin not only your own health, but that of your descendants. The time is approaching when society will deal with your case publicly, as it does with diphtheria or small-pox or leprosy. It is up to you.

The World War left continental Europe in a desperately demoralized and distracted condition, with the necessity of creating a new social order or of wallowing indefinitely in the slough of despond. The peace did not make peace, as shown by the map and the unsettled state of Eastern Europe, and the European War itself indicates that war waves, which formerly moved from north to south, now tend to move from east to west. Internationalism, the socialization of the world, with armies and navies doing police duty for the common good, is the dream of all advanced and enlightened spirits, but implies a world-wide social order, more open-minded and tolerant, better tempered, better disciplined, better educated by experience, than any existent at the present time when the "Red" Army of communal Russia is the largest in Europe.

⁷P. M. Ashburn; *MILITARY SURGEON*, Washington, March, 1920, xlv, p. 323.

As our country swings back to normal, let us hope that our people will begin to realize that wars are biological phenomena, that armies such as ours exist to stabilize society and to maintain peace, that "to steal away a nation's sword is to be the surest enemy of peace" (Novalis). The principal lesson we have learned from the European War is unquestionably that to attempt to prepare for a war of magnitude in unit time is a wasteful and extravagant procedure the cost of which is ultimately borne by the people, and that without reasonable preparedness we may be again caught napping, and like other Anglo-Saxon countries "go through the sad probation all again." Our Army has been likened to the fire department of a large city: in periods of quietude its very existence (little as this fact is realized) helps to stabilize the social order into a sense of security; in time of emergency it is there to put out the fire. Preparedness means preparedness to maintain peace as well as to make war. Wars of the future are likely to be of even more destructive character than the World War; the possibilities of using chemical, electrical and pathogenic agents are already vaunted; and in such wars the services of the Medical Department will be of even greater use and value. In the words of Taylor:⁸

"The world was far from even apprehending what it has yet to learn thoroughly, that in the field the distribution of medical supplies, prompt evacuation, skillful first aid, shelter, food, and restoratives available early for every fallen combatant are of infinitely more importance than highly technical relief to difficult cases. More critical still are the problems relating to later demobilization, to hospitalization and rehabilitation of war victims, and the faithful but well-ordered and economical relief of the wreckage of war. Millions will be spent and more millions wasted until the time comes when it is a recognized part of the program of national defense to organize methods of post bellum relief at the same time that activities are initiated for the prosecution of hostilities. We have progressed from the day of medical attendance for leaders to medical attendance for all combatants, and leaders are increasingly alive to the immediate necessary needs of their forces; but we have not yet attained to a comprehensive grasp of the requirements or possibilities of military medicine."

⁸J. S. Taylor: United States Naval Medical Bulletin, Washington, 1921, xv, No. 3.

